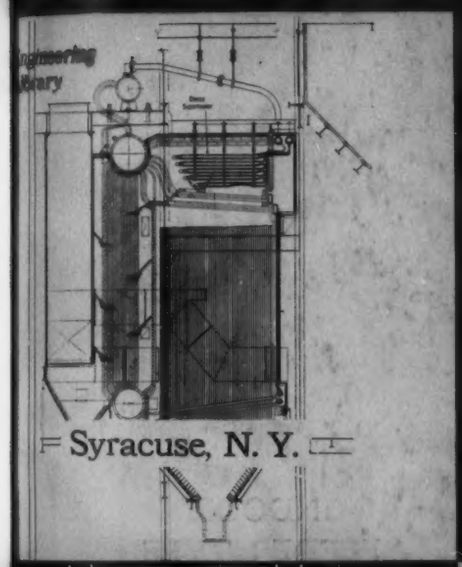
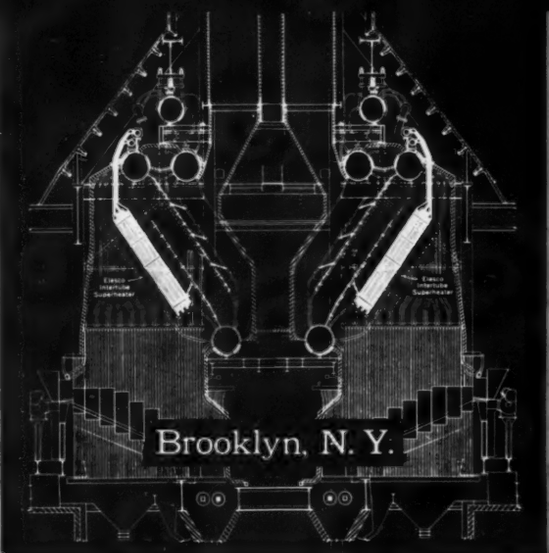
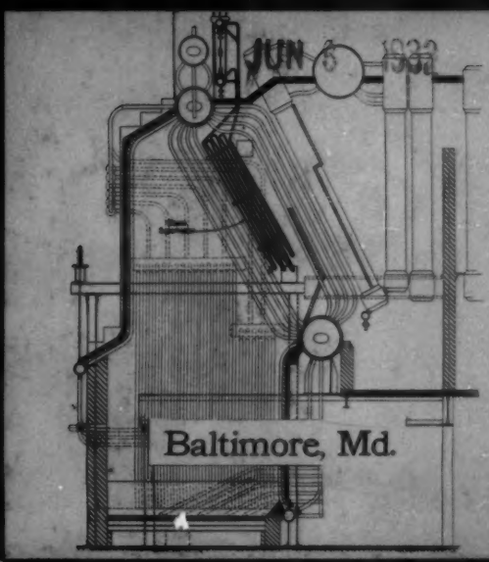
ELECTRICAL WORLD

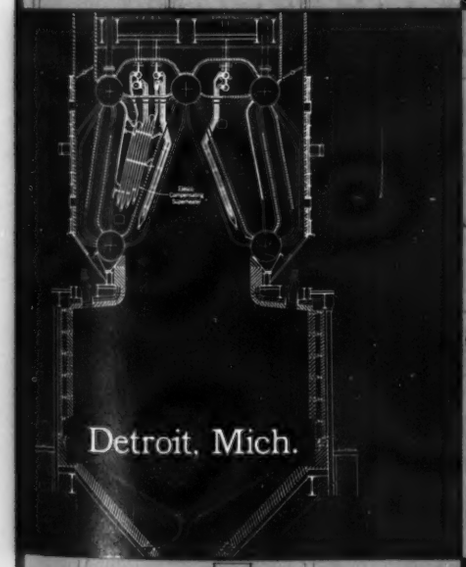
McGraw-Hill Publishing Company, Inc.

JUNE 4, 1932
25 cents per copy


Syracuse, N. Y.


Brooklyn, N. Y.


Baltimore, Md.


Detroit, Mich.

Layouts of

ELESCO

Superheaters

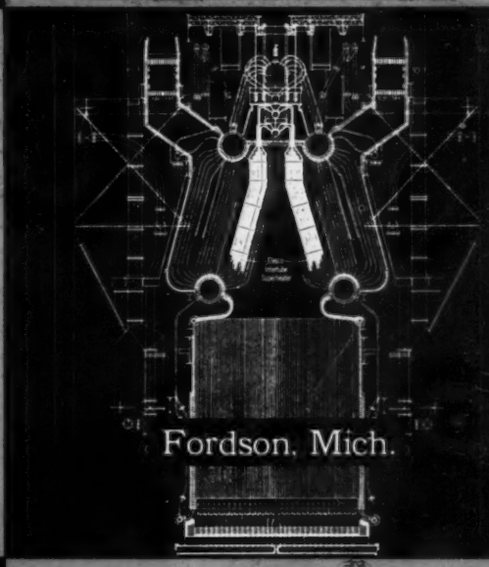
in the most modern stations

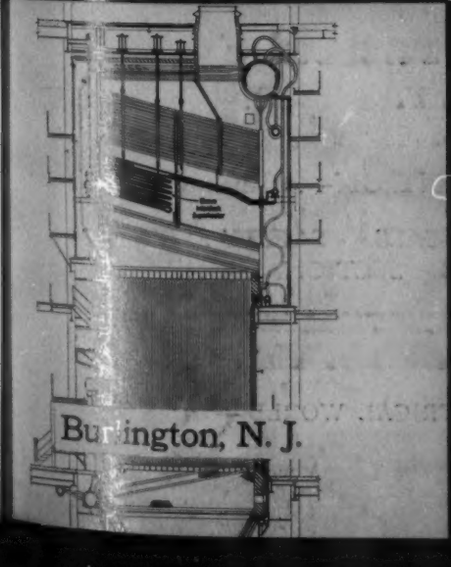
are shown at Booths 308-310
National Electric Light Ass'n.

We shall be pleased to send copies on request.

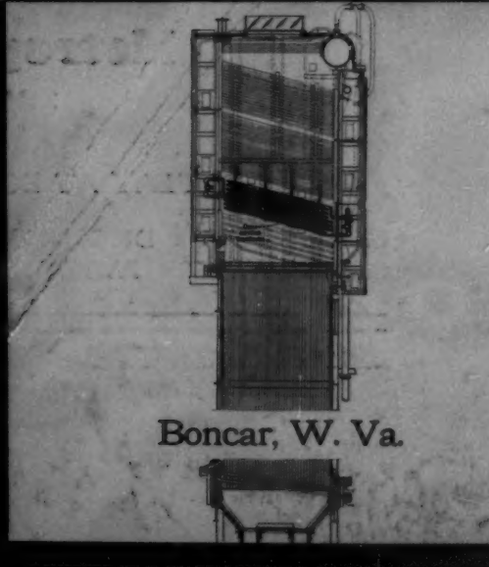
THE SUPERHEATER COMPANY
60 East 42nd Street NEW YORK

A-700


Fordson, Mich.


Burlington, N. J.

Michigan City, Ind.


Boncar, W. Va.

MURRAY
Low Loss* Reactors

INDOOR
FEEDER TYPE

*Trade Mark Registered

THE RIGHT KIND OF REACTOR PROTECTION DOESN'T "COST" IT PAYS

LARGE COPPER AREAS, ENAMELED AND INSULATED
CONDUCTORS, RUGGEDNESS, LOW SPACE REQUIREMENTS
HIGHEST EFFICIENCIES, CORRECT MECHANICAL DESIGN
PROMPT DELIVERIES

Metropolitan Device Corporation

1250 Atlantic Avenue, Brooklyn, N. Y.

Other Murray Distribution Devices
ON DISPLAY AT BOOTHS NOS. 431-433 N.E.L.A. CONVENTION—Atlantic City

CABLE RACKS DISCONNECT PLUGS GROUND RODS METER SEALS SAFETY SWITCHES
CABLE SLEEVES FAIRLEADERS LADDER RIG RANGE SWITCHES SECTIONALIZING UNITS

ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

ALLEN M. PERRY
Managing Editor
EARL WHITEHORNE
Contributing Editor
G. F. WITTIG
Statistical Editor
A. E. KNOWLTON
Associate Editor
F. C. WELLS
News Editor
E. R. SEARLES
Assistant Editor

L. W. W. MORROW, *Editor*

FRANK R. INNES
Western Editor
520 N. Michigan Ave.
Chicago
H. S. KNOWLTON
New England Editor
1427 Statler Bldg.
Boston
PAUL WOOTON
Washington
Correspondent
National Press Building
Washington

JAMES H. RUDD
Publishing Director

Penstocks of the 270,100 hp. station at Cardano, Italy

JUNE 4, 1932

Contents, Copyrighted, 1932, by McGraw-Hill Publishing Company, Inc.

VOLUME 99 . . . NUMBER 23

Common-Neutral Practice Confirmed in California 980

Capacitors to Save Cost in Less Than Two Years 984
By E. WADSWORTH STONE, *Bigelow-Sanford Carpet Company, Inc.*

Voltage Survey Points to Closer Feeder Regulation 986
By L. F. KOONTZ, *General Electric Company*

Why You Can't Buy Oil on Specifications Alone 992
By K. A. NEWMAN, *E. F. Houghton & Company*

Adequate Wiring Stimulated by Utility Certification 994

News of the Industry 969
Editorials 978
Guarding Against Loss of Field . 983
Boston's Branch Libraries Feature Modern Lighting 985
Variety of Temporary Services from Transformer Trailer 990
Unusual Chain of Events Results in Service Interruption . 993
Multi-Circuit Riser Structure Designed for Safety 993
Electric Cooking Aided by Black-Bottom Utensils 997
Contract for Central-Station Exhibit Closed 997
Readers' Forum 998
Book Reviews 998
Men of the Industry 999
New Equipment Available 1000

Electrical World articles are indexed in Industrial Arts and Engineering Indexes, available in public libraries

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

CHICAGO, 520 North Michigan Ave. 883 Mission St., SAN FRANCISCO Aldwych House, Aldwych, LONDON, W.C. 2

JAMES H. McGRAW, Chairman of the Board
MALCOLM MUIR, President
JAMES H. McGRAW, JR., Vice-Pres. and Treas.
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
H. C. PARMELEE, Vice-Pres. and Editorial Director
HAROLD W. McGRAW, Vice-President
C. H. THOMPSON, Secretary

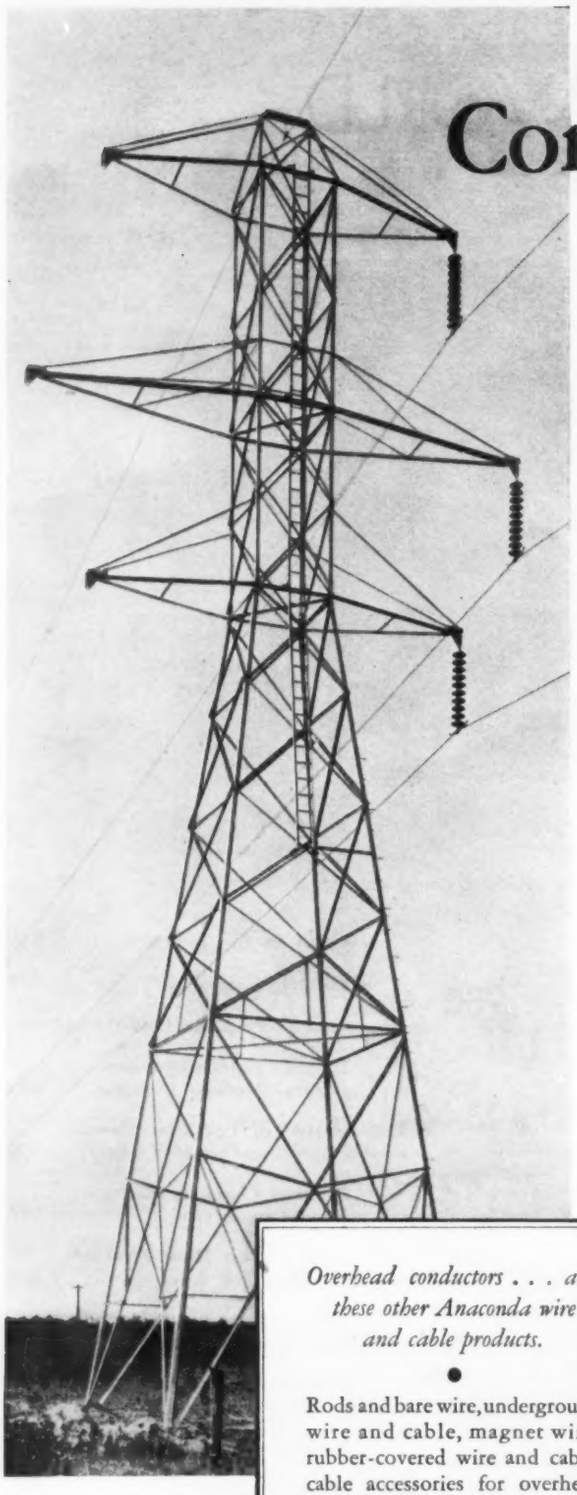
Published weekly. $5 per year. 25 cents per copy. Central and South American countries, $7. Foreign, $9 U. S. currency, or 45 shillings per year. Canada subscription price (including Canadian duty), $7.50. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

CABLE ADDRESS: "MCGRAWHILL, N.Y."

Member A.B.P. *Member A.B.C.*

NUMBER OF COPIES PRINTED THIS ISSUE, 16,015

WASHINGTON, National Press Building
PHILADELPHIA, 1600 Arch Street
CLEVELAND, 501 Guardian Building
DETROIT, 2-257 General Motors Building
ST. LOUIS, 1556 Bell Telephone Building
BOSTON, 1427 Statler Building
GREENVILLE, S. C., 1301 Woodside Building
LOS ANGELES, 339 Chamber of Commerce Building



Conductors that give *greater reliability* at low cost

IN DESIGNING an important tie-line from the new Hardy Dam generating station to the existing lines of their system, engineers of the Consumers Power Company kept these two opposing factors in mind:

1. That the overall cost of the line must be kept down to a minimum, *but* . . .
2. That the more important factor of reliability must be given preference.

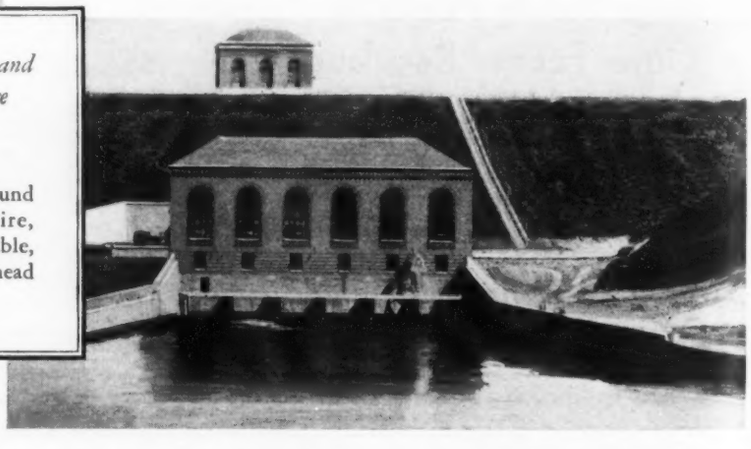
In order to provide the greater reliability at the lowest commensurate cost, the engineers of this prominent mid-western company specified hard drawn Copper conductors. This 140,000 volt connecting line . . . designed with extreme care and constructed to specifications with Anaconda copper conductors . . . will add another transmission line with an enviable operating record to the Consumers Power Company's state-wide network.

Anaconda produces and recommends conductors of copper and copper alloys for every overhead and underground use. Our Engineering Department will gladly cooperate with you on your own particular problems.

Overhead conductors . . . and these other Anaconda wire and cable products.

●

Rods and bare wire, underground wire and cable, magnet wire, rubber-covered wire and cable, cable accessories for overhead and underground use.



ANACONDA
from mine to consumer

Generating plant and (above) view of the Hardy Dam-Grand Rapids transmission line.

ANACONDA WIRE & CABLE COMPANY

GENERAL OFFICES: 25 BROADWAY, NEW YORK
CHICAGO OFFICE: 20 NORTH WACKER DRIVE
Sales Offices in Principal Cities

ELECTRICAL WORLD

Established 1883. McGraw-Hill Publishing Company, Inc.

for the Week Ending

June 4, 1932

Senate Bill Puts Tax of 3 per Cent on Gross Receipts of Power Companies

SPURRED by the President, the United States Senate early Tuesday rushed to completion and passage its budget-balancing tax bill. Among the changes made at the eleventh hour is the inclusion of a tax of 3 per cent on the gross receipts of electric light and power companies from the distribution of electrical energy, "payable from net income but not otherwise"—in effect a sales tax on all electricity sold by private utilities so framed that it cannot be passed to the consumer without an increase of rates. Publicly owned plants are by the terms of the bill exempt.

This tax clause was substituted by the Senate for a tax put in the bill by the finance committee which would have placed a 5 per cent levy on electricity and gas for domestic consumption, "to be paid by the person paying for such electrical energy or gas and to be collected by the vendor." Senators objected on the ground that this was a tax only on domestic and not on commercial consumption and was a direct levy on the consumer. After nearly two hours of debate the committee amendment was voted down, 45 to 40. Senator Reed of Pennsylvania immediately reoffered it, with the addition of "commercial" users. Not even this change was satisfactory, however, and the revised amendment was defeated, 47 to 35. The vote on the 3 per cent tax amendment, sponsored by Senator Howell of Nebraska, followed quickly. It was adopted by 61 to 19.

The general manufacturers' sales tax advocated by many senators and by the President was defeated, 55 senators having signed a "round robin" to oppose it. The import duty of 4 cents a pound on copper went through along with other tariff clauses.

The bill quickly went to conference.

▼

Senators Would Bar Rate Appeals to Federal Courts

A report favoring the Johnson bill withdrawing jurisdiction from United States district courts to enjoin, suspend or annul any order of a state board or commission affecting intrastate public utility rates has been made by the judiciary committee of the United States Senate. Court action on such rates would by the Johnson bill be limited solely to state courts wherever the state laws provide an effectual remedy for inequitable decrees.

The report criticises the practice by utility corporations of going into federal district courts and alleging that rates fixed by the state commission are confiscatory and therefore violate the Fourteenth Amendment to the Constitution. It asserts that often when these cases come into the federal court the investigations conducted by the commissions are ignored.

▼

Ottawa Parliament Is Over Without St. Lawrence Pact

The Canadian Parliament has concluded its labors without putting the seal of approval on the St. Lawrence waterway pact with the United States. On the last day of the session, in answer to a question by Mackenzie King, opposition leader, Premier Bennett stated that a number of questions involving the Province of Ontario have yet to be settled in connection with the waterway and until these are disposed of it will be impossible to conclude a treaty with the United States. The Prime Minister did not know the exact time when these matters would be settled. It might be ten days or two months, he said.

Another member asked the Prime Minister whether agreement had been reached as to the ownership of water powers in the international section of the river. Mr. Bennett replied that until this matter shall have been dealt with by the highest court no decision on the point can be made, but for the purposes of the agreement between Ontario and the Dominion the water powers in the international section are regarded as being the property of Ontario.

This Week

Feeder regulation a key to better service and profits. p. 986

No benefits, no holding company, is Maltbie's view. p. 972

Westinghouse employee sales succeed; General Electric will try it. p. 974

Certification plan stimulates adequate wiring. p. 994

40-ton induction-type furnace developed. p. 977

You can't buy oil solely on specifications. p. 992

Power-factor correction paid for itself in two years. p. 984

Table Rock and Augusta Hydro Projects Languish

Postponement for one year of the issuance of a license for its proposed sixteen - million - dollar hydro - electric plant, involving a dam across White River at Table Rock, Taney County, Mo., is asked of the Federal Power Commission by the Empire District Electric Company of Joplin—a Doherty operating utility. The company's representatives said that at present it can care for the needs of its consumers without the new plant and that it would be unfair to load the carrying charges on them. Half a million dollars had been spent in initiating the project, Henry L. O'Brien, counsel, said, but he doubted whether construction would be advisable within five years.

Members of the commission expressed their willingness to take judicial notice of the prevailing economic conditions which might be unfavorable to construction at this time, but expressed doubt as to whether they have power to grant the delay. Decision was deferred.

Savannah River Project Given Up

Application for cancellation of the license granted nearly four years ago by the Federal Power Commission to the Savannah River Electric Company for a dam across the Savannah River at Clark's Hill, 19 miles above Augusta, has been filed. The company obtained a license to build a dam 110 ft. high, with a proposed lake area embracing about 45,000 acres. It was to have an ultimate capacity of 120,000 hp., to cost $20,000,000 and to serve territory on both sides of the Georgia-South Carolina boundary. Local complications revolving around the Augusta power canal, a municipal project, have hindered progress, further hampered by the depression.

▼

City-Company Co-operation Sought in Los Angeles

A co-operative arrangement between the Southern California Edison Company and the Los Angeles Bureau of Power and Light, whereby the company offers certain electrical energy, steam-plant standby service and rate reductions in return for delay in construction of the bureau's proposed steam generating station at Wilmington, has been proposed by the company to the city's Water and Power Commission. The commission instructed E. F. Scattergood, chief electrical engineer of the bureau, and a member of the city's legal staff to frame a reply.

The Edison company's offer, made by Vice-President Fred B. Lewis, proposed, as an alternative to construction of the city plant, that the city and the company join in a ten-year contract whereby the company will continue to sell the Power Bureau the energy it requires above its own production, with a 6 per cent reduction in rates effective January 1, 1933, subject to approval of the commission, and a further reduction January 1, 1934, to be worked out by negotiation. In the meantime the city could avail itself of the company's steam plant at Long Beach for standby service. Construction of the city's proposed steam plant, Mr. Lewis pointed out, at a cost of $12,000,000, would create a duplication of facilities, and after the entry of Hoover Dam power the plant would remain idle except for standby service which the company can provide.

▼

Institute Ready for Cleveland Meeting

PHILADELPHIA, Detroit, Boston and Chicago will all be drawn upon for data on the combined aspects of reliability and economy in the operation of large electric systems—that being the subject of one of two symposiums arranged to be held at the forty-eighth annual summer convention of the American Institute of Electrical Engineers in Cleveland, June 20-24. The other symposium will be on conductor vibration. Five other technical sessions will deal respectively with electrical machinery, electrochemistry and electrometallurgy, protective devices, automatic stations and communication, while an eighth will provide papers on selected subjects—fields of design, theory, research and operation being all thus covered. Still another session will be devoted to education, the first for a number of years. Entertainment, inspection trips and sightseeing will be provided as usual, but the formal banquet will be omitted. The president's reception will be on Monday evening.

Program for Cleveland Convention of A.I.E.E.

MONDAY, JUNE 20

Morning.—Presentation of prizes for papers; Lamme medal presentation; president's address, C. E. Skinner.

TUESDAY, JUNE 21

Morning.—Education: Address, W. E. Wickenden; "Engineering Subjects, Electrical and Cognate, in the Four-Year College Program," A. H. Lovell; "Educational Aspects of Engineering and Management," R. E. Doherty. "Adult Technical Education in Metropolitan Areas," O. W. Eshbach.

Symposium on Combined Aspects of Reliability and Economy in the Operation of Large Electric Systems: "Philadelphia Electric Company's System," J. W. Anderson and Herbert Astrada; "Detroit Edison Company's System," A. P. Fugill; "Edison Electric Illuminating Company of Boston's System," R. E. Dillon. "Chicago District," L. L. Perry and F. V. Smith.

Electrochemistry, Electrometallurgy and Research: "Electrical Equipment for Precipitation Service," H. Speight and V. G. Rydberg; "Oxide Coatings on Aluminum," J. D. Edwards, Martin Tosterud and H. K. Work; "Calculation of Inductance and Current Distribution in Low-Voltage Connections to Electric Furnaces," C. C. Levy; "New Applications of Non-linear Circuits to Relay and Control Problems," C. G. Suits.

WEDNESDAY, JUNE 22

Morning.—Electrical Machinery: "Co-ordination of Transformer Insulation with Line Insulation," V. M. Montsinger and W. M. Dann; "Co-ordination of Distribution Transformers," E. D. Treanor and W. H. Cooney; "Load Ratio Control Circuits," L. F. Blume; "Characteristics of Surge Generators for Transformer Testing," P. L. Bellaschi; "Influence of Brush Contact Drop on Commutation," L. R. Ludwig and R. M. Baker; "Single-Phase Short-Circuit Torques of Synchronous Machines," C. A. Nickle, M. L. Henderson and C. A. Pierce; "Transient Analysis of A. C. Machinery—II, Extension to Salient-Pole Machines," Yu H. Ku. Communication: "Wire Communication Aids to Air Transportation," H. H. Nance; "Characteristics of Electromagnetic Radiation from Aircraft in Flight," J. C. Coe and T. C. Rives; "Vertical Sound Records," H. A. Frederick and H. C. Harrison.

THURSDAY, JUNE 23

Morning.—Selected Subjects and Technical Committee Reports: "Adequate Wiring of Buildings an Essential for Good Illumination," G. H. Stickney and Walter Sturrock; "Induction-Motor Versatility—the Nature of Its Applications," E. W. Henderson; "Dynamic Braking of Synchronous Machines," E. E. Kilbourne and I. A. Terry; "Current Propagation in Electric Railway Propulsion Systems," J. F. Riordan. Protective Devices: "Application of High-Speed Relays," G. W. Gerell; "High-Speed Reactance Relay," A. R. van C. Warrington; "Relay Operation from Bushing Potential Devices," P. O. Langguth and V. B. Jones; "Operation of Relays from Carrier-Current Coupling Capacitors and Capacitance Transformer Bushings," J. E. Clem and R. M. Cordray; "The Boric Acid Fuse," A. P. Strom and H. L. Rawlins.

FRIDAY, JUNE 24

Morning. — Automatic Stations: "Torque Balance Telemetering," A. J. Johnston; "Developments in Two-Wire Supervisory Systems," J. H. Oliver; "Operating Experience with Supervisory Control on the Reading-Philadelphia Suburban Electrification," J. E. Pastoret; "Application and Performance of Automatic Equipment on the American Gas & Electric Company's System," Philip Sporn and H. E. Turner; joint committee report on telemetering, supervisory control and associated communication circuits. Symposium on Conductor Vibration: "Stress-Strain Studies of Transmission-Line Conductors," G. W. Stickley; "Vibration and Fatigue in Electrical Conductors," A. E. Davison, J. A. Inglis and V. M. Martinoff; "Vibration of Overhead Transmission Lines," R. A. Monroe and R. L. Templin; "Transmission-Line Vibration Due to Sleet," J. P. Den Hartog.

Commission Allots San Joaquin Reductions

Residential consumers get largest cut, agriculturists come next, then users of commercial lighting —Many utility expenses are stricken out.

DOMESTIC and commercial users of lighting will get the largest proportion of the reduction in light and power rates on the San Joaquin and Midland systems, according to an order of the California Railroad Commission issued last week. As before reported, the commission had fixed the total reduction at the sum of $650,000 and had held conferences with utility officials and consumers regarding its apportionment. The figures arrived at are: Domestic lighting, $192,300; commercial lighting, $132,500; public outdoor lighting, $33,500; domestic combination heating and cooking, $30,300; commercial heating and cooking, $4,800; general power, $93,300; agricultural power, $159,000; street-railway power, $4,300. The total urban saving is $423,800 and the total rural saving $226,200. Not all consumers will be benefited by the new tariff.

Agricultural power gets a 12½ per cent discount on charges for energy in excess of 1,000 kw.-hr. per horsepower of connected load. This, it is said, will extend the reduction to those consumers who are not merely short-time users and whose equity is stronger than that of those who use power "merely for a short time during the peak of the irrigation season." The reduction to agricultural power lowers the yield on this load to approximately 6 per cent, on the Farm Bureau's basis of allocating property and cost.

Other rates are brought more closely into alignment with Pacific Gas & Electric Company schedules. The findings center about operations for the year 1932, "considered as a normal or average water year, with business conditions slightly, but not substantially, better than in 1931."

Charges by the Pacific Gas & Electric and Great Western Power companies for tie-line power are reduced about $250,000 to the basis of charges existing prior to the time the Pacific Gas & Electric Company acquired control of the utilities. A further reduction in these charges, it is said, would be unfair to the consumers of the Pacific Gas & Electric Company and Great Western Power.

Depreciation expense and general expenses are cut. Eliminations are made in fees and donations. A service fee or charge to the Pacific Gas & Electric Company is disallowed. Large claims to going value are disallowed. Valuation expense is allowed on the theory that the management of the utilities, when their entire rate structures were attacked, had a reasonable range of discretion in steps taken to resist the attack, However, the amount is spread over a ten-year period and the opinion carries a carefully phrased warning to utilities against such expenditures in the future.

Historical or recorded cost with land at present-day values is taken as a rate base, as urged by nearly all of the parties, the rate base of the San Joaquin company being fixed at $60,200,000 and that of the Midlands company at $6,200,000. Rate of return allowed is approximately 7 per cent.

▼

Merchandising Looked Into at East Central Meeting

Mistakes made by utilities in merchandising practices are chargeable to enthusiasm to get the job done So declared C. L. Proctor, Toledo Edison Company, in his presidential address to the East Central N.E.L.A. convention in Toledo, May 24-27. He continued: "As merchandisers we have learned a lot, and I think all of us are now convinced that the greatest good for all concerned—merchants, utilities and, last but most important, our customers—lies in a sincere endeavor to work together and to meet together with an honest desire to correct any faults that may exist. My belief is, from the experience of our own company, that this can be best be done in each local situation by frank discussion."

The same kind of thinking appeared in the talk by J. F. Owens, national president, who said that the public has a right to expect utilities to merchandise and that merchandising is not a privilege assumed by the utilities but a duty imposed upon them. He also said that in those situations in which utility merchandising has infringed upon the rights of independent dealers the only remedy was in candid discussion and sincere co-operation.

The importance of training employees properly to represent the utilities in their contact with the public was emphasized by A. Bliss McCrum, Charleston, W. Va., who said that the utilities would bear the brunt of political attacks.

Papers and addresses on the world's economic situation by Grove Patterson, editor of the Toledo *Blade;* on the progress of the refrigeration campaign by Dr. G. W. Allison, on training employees for safety by H. E. Crain, Ohio Power Company; on rural electrification by Prof. G. W. McCuen, Ohio State University; on N.E.L.A. policy by Bernard F. Weadock, executive director, and on cost of government by Paul S. Clapp rounded out a four-day meeting of much profit to the 400 in attendance.

Officers elected were: President, C. E. Torrey, Ohio Power Company, Canton; first vice-president, L. W. McLellen, Kentucky Utilities Company, Louisville; second vice-president, G. E. Miller, Cleveland; third vice-president, L. G. Tight, Akron; secretary-treasurer, D. L. Gaskill (re-elected).

▼

U.G.I. Celebrates Its Fiftieth Anniversary

United Gas Improvement Company achievements during the half century of its corporate existence which has just come to an end were the main theme of speeches delivered at the company's offices in Philadelphia at a celebration on Wednesday afternoon of this week. The speakers were John E. Zimmermann, president of the U. G. I.; George B. Cortelyou, president Consolidated Gas Company, New York; Mayor J. Hampton Moore of Philadelphia, and Morris L. Clothier, senior director of the U. G. I. Mr. Zimmermann and Mr. Cortelyou dealt also with general business conditions, Mr. Zimmermann citing some causes which in his view led to the troubles of today.

Samuel T. Bodine, chairman of the board, who has been attached to the company through its entire life, unveiled a bronze tablet, designed by Dr. R. Tait McKenzie, commemorating the company's anniversary.

Balanced Budget Hope Revives

PRESIDENT HOOVER this week addressed the Senate personally, pointing out: "In your hands at this moment is the answer to the question whether democracy has the capacity to act speedily enough to save itself in an emergency. Time is the essence. Every day's delay makes new wounds and extends them.

"The continued downward movement . . . has been particularly accelerated during the past few days . . . Foreign countries know from bitter experience that the course of unbalanced budgets is the road to ruin. They do not realize that, slow as our processes may be, we are determined and have the resources to place the finances of the United States on an unassailable basis.

"We have three major duties to perform: (1) Drastic reduction of expenditures, (2) passage of adequate revenue legislation, (3) passage of adequate relief legislation."

Security markets slump wildly; support for bond market likely. Car loadings, energy production and commodity prices decline. Senate passes tax bill, including 3 per cent levy on gross receipts of power companies

Coming Meetings

National Electric Light Association—Atlantic City, N. J., June 6-10. A. J. Marshall, 420 Lexington Ave., New York.

Pacific Coast Electrical Association—Hotel Huntington, Pasadena, Calif. June 14-17. K. I. Dazey, 447 Sutter St., San Francisco.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 15-17. B. C. Fairchild, 409 Power Bldg., Montreal.

Public Utilities Advertising Association—Waldorf-Astoria, New York, week June 19. J. R. Pershall, Public Service Co. of Northern Illinois, Chicago.

Association of Iron and Steel Electrical Engineers—William Penn Hotel, Pittsburgh, June 20-23. J. F. Kelly, Empire Bldg., Pittsburg.

American Society of Agricultural Engineers—Ohio State University, Columbus, Ohio, June 20-24. Raymond Olney, St. Joseph, Mich.

American Institute of Electrical Engineers—Summer convention, Cleveland, June 20-24; Pacific Coast convention, Vancouver, B. C., Aug. 29-Sept. 2. H. H. Henline, 33 West 39th St., New York.

American Society for Testing Materials—Chalfonte-Haddon, Atlantic City, June 20-24. C. L. Warwick, 1315 Spruce St., Philadelphia.

American Society of Mechanical Engineers—Bigwin Inn, Lake of Bays, Ontario, June 27-July 1. C. W. Rice, 29 W. 39th St., New York.

New England Division, N.E.L.A.—Mount Washington Hotel, Bretton Woods, N. H., July 11-13. Miss O. A. Bursiel, 20 Providence St., Boston.

Camp Co-operation XII—By boat to Bermuda, Aug. 3-8. Society for Electrical Development, 420 Lexington Ave., New York.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 7-9. H. A. Buch, Telegraph Bldg., Harrisburg.

Rocky Mountain Division, N.E.L.A.—Stanley Hotel, Estes Park, Colo., Sept. 12-14. G. E. Lewis, 367 Gas & Electric Bldg., Denver.

Empire State Gas & Electric Association—Saranac Lake, N. Y., Sept. 22 and 23. C. H. B. Chapin, Grand Central Terminal, New York.

Illuminating Engineering Society—New Ocean House, Swampscott, Mass., Sept. 26-30. E. H. Hobbie, 29 W. 39th St., New York.

National Electrical Wholesalers' Association—Hotel Statler, Buffalo, N. Y., Sept. 26-30. E. Donald Tolles, 165 Broadway, New York.

▼

California Commissioner on Holding-Company Issue

Clyde L. Seavey, president California Railroad Commission, recently spoke on "Twenty Years of Public Regulation." Concerning holding companies he said:

A few years ago we beheld the spectacle of investment houses offering fabulous prices for public utility properties in this state. None of them had sufficient credit to buy a property of any magnitude. They proposed to consolidate the management of small properties on the plea of better service and credit. The commission allowed the consolidation of properties but modified the financial plans presented, because it believed the local companies should be financed on a basis which would enable them to function without the assistance of a holding company. One group agreed to pay $2,872,443 for some twenty properties which would be transferred to a local company for $3,380,600, payable through the issue of $3,480,600 of stock. The commission authorized the company to issue $2,256,300 in securities. Another group paid $11,344,000 for properties and asked to issue $13,659,300 in stock and bonds. They insisted that the properties had a sound value of $15,500,000. The commission authorized $10,515,300 in stocks and bonds. At present one holding company is in the hands of a receiver and the other for the past eighteen months has been unable to assist in financing the local company. However, the operating California companies are continuing to keep up the standard of service to their consumers.

▼

Maltbie Denies Usefulness of Many Holding Companies

Ranging himself squarely with the critics of superholding companies in the utility industry, Chairman Milo R. Maltbie of the New York Public Service Commission last week said:

Experience has shown that holding companies which are the result of pyramiding security issues resulting from the acquisition of securities at high prices are not elements of strength but of weakness, and that when crises come and stringency develops in the money market holding companies cannot obtain funds. The underlying operating companies must then depend upon their own resources to raise the capital that is needed, and they can do it on much more favorable terms than the holding companies.

Indeed, at present, companies that hold only securities and own no operating properties find it practically impossible to obtain funds, and the market value of their securities has descended to depths of which no investor dreamed when he was enticed by rosy prospectuses and promises of great earnings to pass by the securities of operating utilities and invest in the securities of holding companies.

Chairman Maltbie's opinion accompanied a refusal by the commission to authorize the Long Island Capital Corporation to acquire certain outstanding stock of the Long Island Lighting Company. He held that the addition of a holding company to the Long Island system would be "an element of weakness" and that "many other systems would be better off without top-heavy holding companies, the exaggerated claims of financial superiority of which were mere myths." He also pointed out that the commission has very limited powers over holding companies and that the Long Island Capital Corporation would be subject to far less supervision by the commission than the Long Island Lighting Company.

The application just refused was made in April, 1929, before William A. Prendergast, then chairman of the commission. At that time E. L. Phillips, president of both companies concerned, advocated the setting up of the new company as an advantageous means of obtaining capital.

Federal Power Commission Wins in Clarion River Case

Affirmation of the jurisdiction of the Federal Power Commission to determine the original cost of and net investment in projects constructed by its licensees was given May 31 by the Court of Appeals of the District of Columbia, which supported the decree of the Supreme Court of the District in the case of the Clarion River Power Company.

The appeal, it will be remembered, was by the Clarion River company from a decree dismissing a suit to determine whether the federal water power act authorized the commission to conduct an official hearing to ascertain cost of and investment in the Piney plant in Pennsylvania. The Clarion River company received a 50-year license in 1922 and in 1930 filed a statement representing the actual, legitimate cost of the construction of the project to be $11,032,816. After an investigation by the accounting division of the commission a report was filed recommending the elimination of $6,213,904 from this amount, and the company protested.

"The statute requires the licensee to submit to the commission statements covering net investment and cost of the project," the Court of Appeals said, "and we think it plain that the purpose of requiring the licensee to make provision for currently determining the cost is to enable the commission as the administrative body, not the licensee, currently to make such determination. . . . It follows, therefore, that the commission was acting within its jurisdiction."

▼

Montreal Consolidated's New Construction Program

A construction program planned for this year, totaling approximately $1,250,000, has just been announced by the Montreal Light, Heat & Power Consolidated. It includes additions to transmission, substation and distribution facilities amounting to about $850,000, the rest of the appropriation being allotted to the gas department. The Beauharnois plant on the St. Lawrence, in which Montreal Light, Heat & Power allies are substantially interested, is under contract to deliver 25,000 hp. to the utility in October, and two miles of 110-kw. transmission line will be built to connect the Beauharnois power house with the present Cedars-Atwater transmission line. Extension of facilities at the Atwater and Lasalle substations are planned to the extent of more than $500,000, while changes in the distribution system will include the complete reconstruction of the old Verdun system as well as reconstruction in the western part of the city.

Cities Service Company Omits Dividends

Five companies of the Cities Service group have omitted all dividends on their preferred and common stocks, including the Cities Service Company, Cities Service Power & Light Company, Empire Gas & Fuel Company, Arkansas Gas & Fuel Corporation and Louisiana Oil Refining Corporation. The stock dividend on the common stock of the Cities Service Company was also discontinued. Following this dividend announcement the stocks dropped considerably in a flood of selling, which brought Cities Service common to $1.75 on the New York Curb Exchange.

Henry L. Doherty stated that an annual saving of $20,000,000 would result from the omission of all disbursements on these securities. "There have been reductions in both bank loans and cash," he said. "The former totaled around $56,000,000 at the end of April this year, and the latter was $28,000,000." On December 31, 1931, the company showed bank loans of $68,784,622 and cash of $41,817,256.

"There is no chance for any corporate financing at the present time," continued Mr. Doherty, "and it does not appear likely that there will be any opportunity for such financing for the next couple of years. . . . We have but one maturity in the next five years, . . . and although no definite plans have been made as yet, we have discussed the matter with bankers and believe that it will be taken care of. Earnings should be better in 1932.

▼

Only One Light and Power Issue Floated in May

The general contraction in new offerings of securities which characterizes industrial organizations has also set in in the case of public utility undertakings, and, in line with this tendency, only one electric light and power offering was made during the month of May. This issue was offered by the Wisconsin Power & Light Company in the form of first lien and refunding mortgage 6 per cent bonds, a piece of financing involving a total amount of $1,000,000.

▼

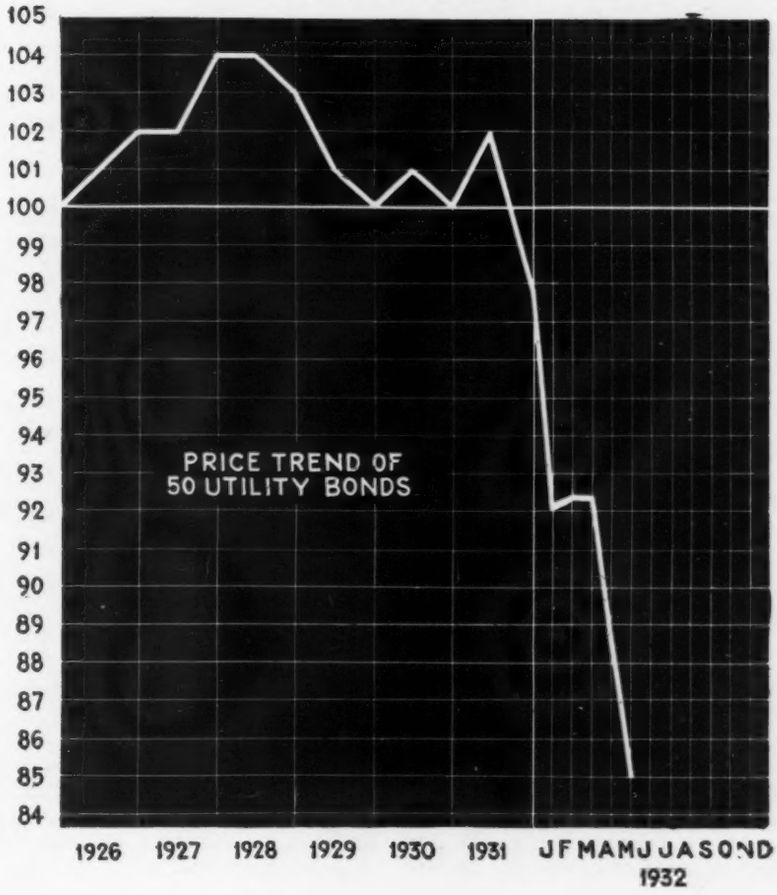
Beauharnois Bondholders Call Meeting

A meeting of holders of the Beauharnois Power Corporation, Ltd., 30-year 6 per cent collateral trust bonds has been called in Montreal on June 10 to consider the financial situation of the corporation resulting from the default in interest on the bonds on April 1 and to appoint a committee representing the bondholders with a view to formulating plans for the carrying out of the company's undertaking. The results of the committee's investigation will be reported at a later meeting of bondholders, at which plans will be submitted.

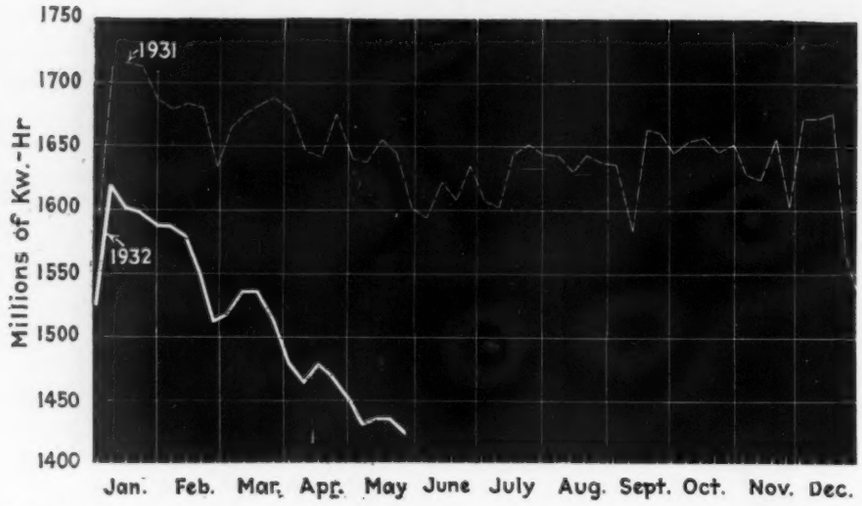
▼

Decline in Stocks and Bonds Continues

The stock market continued to decline during the past week and substantial losses were recorded for public utility issues as well as for the industrials. Bonds were also unsettled, with a general downward trend prevailing.



Small Decrease in Output



ENERGY output of electric light and power plants for the week ended May 28 was 1,425,151,000 kw.-hr., according to estimates announced by the National Electric Light Association on the basis of its weekly survey. This is a decline of 0.7 per cent from the preceding week.

No valid comparison can be made with the corresponding week of last year because in 1931 a holiday was included, whereas in 1932 the holiday fell in the succeeding week. Comparison with the average for several preceding years would also be misleading.

For the same reason no data are announced for changes from 1931 in the various regions.

Weekly Output, Millions of Kw.-Hr.

May 28	1,425	1,602	1,660	1,615
May 21	1,436	1,645	1,723	1,705
May 14	1,437	1,654	1,717	1,704
May 7	1,429	1,637	1,689	1,698
April 30	1,455	1,644	1,698	1,688

▼

Middle West Stockholders' Committees Organized

Formation of the third committee for the protection of the common-stock holders of the Middle West Utilities Company was announced in Chicago last week. The new group, which is said to represent Eastern investment bankers who participated in the distribution of the company securities, is headed by Peter B. Carey, president of the Chicago Board of Trade. Two other committees had previously been formed. One, headed by Martin Lindsay, is said to represent large New York and Chicago commercial banks which hold blocks of Middle West stock as collateral. The other, headed by Burton Colbert, is functioning independently.

▼

Ellis Opposed Bond Issue for Southern Indiana G. & E.

By a vote of three to two the Indiana Public Service Commission has authorized the Southern Indiana Gas & Electric Company of Evansville to issue $5,500,000 in refunding bonds which are to be sold at not less than 88 per cent and to bear interest at the rate of 5½. Public interest was excited by the protest of Commissioner Howell Ellis, who declared that the bonds would be used to reimburse the holding company as against the interests of the bondholders of the operating utility. The Evansville utility is controlled by the Commonwealth & Southern Corporation.

▼

Buying Is Stimulated by Employees' Sales Campaign

Going into the final week of their employees' sales campaign, with 12,000 sales totaling more than a half million dollars, executives and employees of the Westinghouse Electric & Manufacturing Company express confidence that the million-dollar mark will be passed. Everything from a carton of lamps to a contract for completely equipping an apartment building with ranges and refrigerators is included in the list of sales. This means that 150 models of 36 different articles have been sold, representing an additional half-million dollars' worth of sales for the household appliance department of Westinghouse. The plan may be continued.

During the month of June the General Electric Company is undertaking a similar campaign whereby all employees become potential salesmen. By interesting friends, neighbors and relatives to such an extent that an appointment can be made for a professional salesman to call upon the prospect, the employee becomes eligible for a 5 per cent commission on every article sold in this manner, provided each sale is closed before July 30. Not only employees now on the payroll may participate, but also those who have been temporarily laid off since January 1. Sales are to be at established list prices, and eight home appliance products are on the list.

▼

Insurance Company Holds Large Utility Investments

That one of the leading insurance companies of the country considers public utility securities one of the most desirable classes of investment is evidenced in the sixty-fifth annual statement just issued by the Metropolitan Life Insurance Company for the year 1931. This company at the close of the year was holding public utility bonds having a par value of $322,045,750, and of this sum the bonds of electric light and power companies amounted to $216,554,500. Ranking second only to railroad securities in the amount held, electric light and power bonds constitute 15.1 per cent of Metropolitan Life's bond holdings.

A study of the comparative standing of the ten leading life insurance companies of the United States and Canada based on the total amount of insurance each had in force at the end of 1931 showed that the Metropolitan Life Insurance Company was the leading company with a total of $19,447,343,949.

Schedule of Bonds

	Par Value
Public utility:	
Light and power	$216,554,500
Other than light and power	105,991,250
Government	89,009,495
Municipal	182,225,433
Railroad	733,434,490
Industrial and miscellaneous	108,777,539
Total bonds	$1,435,492,707

▼

Oklahoma Gas & Electric Annual Report—1931

Earnings	1931	1930	Per Cent Change
Gross earnings	$11,887,260	$14,284,675	—16.7
Net earnings	5,080,605	5,578,344	—8.9
Operating ratio	57	61	.....

Depreciation allowance, 8.0 per cent of gross earnings and 1.3 per cent of plant investment.
Times prior charges earned 1.5
Net profit per share of common $9.04, against $13.40 in year before.

Output	1931	1930	Per Cent Change
Energy output (kw.-hr.)	489,174,640	643,486,718	—24.0

Average use per residential customer, 501 kw.-hr. as compared with 449 in previous year.

Balance Sheet	1931	1930	Per Cent Change
Total assets	$89,803,763	$90,379,337	—0.7
Funded debt	41,746,500	41,844,800	—0.2
Short-time oans	383,800	9,284	+4034
Capitalization	78,149,000	78,256,700	—0.1
Total surpluses and reserves	7,814,318	8,979,186	—12.9

Ratio current assets to current liabilities this year, 1.5; last year, 2.6.

Cedar Pole Associations Consolidate

In the interest of greater efficiency, closer co-operation, and more effective research and trade promotion, the Western Red Cedar Association, formerly with headquarters located at Spokane, Wash., and the Northern White Cedar Association of Minneapolis have pooled their efforts under the name of the Western Red Cedar Association and the Northern White Cedar Association Consolidated. Headquarters of the enlarged association will be in Minneapolis, Minn.

▼

General Cable Corporation Drops Other Trade Names

According to a recent announcement by the General Cable Corporation, effective June 1, all those products which have been marketed under the individual trade names of its component companies will henceforth be sold under the name and symbol of General Cable. This change is said to be but another logical step, following the foundation of General Cable Corporation in 1927, toward making available to architects and engineers the benefits of the coordinated research, engineering, manufacturing and distributing facilities of General Cable.

▼

Federal Elevator Contract Goes to Westinghouse

"Built-in-Chicago" freight and passenger elevators will serve the occupants of the first of five government buildings to be erected in Washington at a cost of several millions of dollars. Frank C. Reed, vice-president of the Westinghouse Electric Elevator Company, announces that his company has obtained the contract, at approximately $300,000, for 25 passenger elevators and two freight elevators for the Department of Agriculture building, which will stand on Fourteenth Street between B and C Streets. The passenger lifts, with 2,500 lb. capacity and capable of traveling 500 ft. per minute, and the freight elevators, which will each carry 5,000 lb. at a speed of 250 ft. per minute, will make up one of the finest elevator installations in the national capital.

Major New Construction This Week

THREE electrically operated pumping plants and booster stations, cost over $45,000 to be constructed by San Juan Pipe Line Company for 92-mile oil pipe line from San Juan County, Utah, to Farmington, N. M.

Over $75,000 will be expended by S. & K. Utilities Company, New Middletown, Ind., for 55-mile transmission line in Harrison County, with power substation and service facilities for commercial operation. Permission applied for.

Motors, controls, etc., will be installed in the $70,000 addition to be constructed by R. B. Davis Company, Hoboken, N. J., manufacturer of baking powder and kindred products.

Machine drives, motors, controls and electrical auxiliaries to be installed in additions to mill of Combined Locks Paper Company, Combined Locks, Wis. Cost over $75,000.

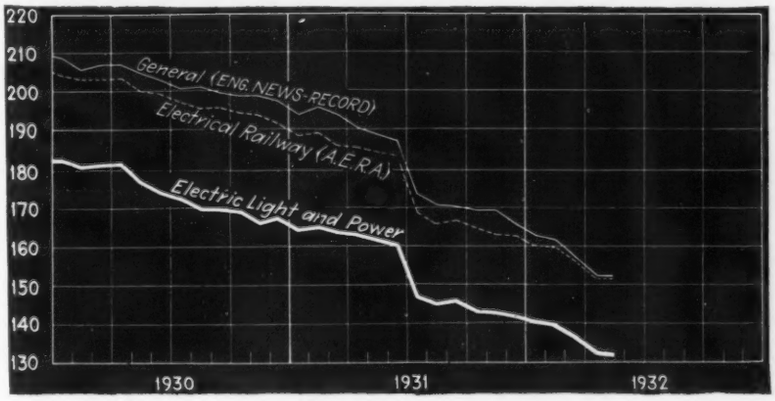
Bids for four turbo-generator sets for Puget Sound Navy Yard asked by Bureau of Supplies and Accounts, Navy Department, Washington, D. C., closing June 14.

Springfield, Ill., will soon take bids through Burns & McDonnell Engineering Company, Kansas City, Mo., for electrical equipment for city-owned light and power plant.

Power substation equipment, underground conduits, light and power wiring, airfield lighting equipment, will be installed at federal bombing base, Marin Meadows, Hamilton Field, Calif. A $1,000,000 project.

Machine drives, motors and controls, conveying machinery and other electric power equipment will be required for one-machine paper mill unit of DePere Paper Manufacturing Company, DePere, Wis. Cost over $65,000.

Construction Costs Leveling Off?



IT MAY be that construction costs are leveling off—at least that is the inference to be drawn from the most recent indices, which show only a slight slip from those for the preceding month.

Construction Cost Indices: Electric Light and Power, Electric Railway and General

Base: 1913 = 100

	Electric Light and Power*	Electric Railway*	General — *Engineering News-Record*
May, 1932	131	151	152.8
April, 1932	132	151	153.1
March, 1932	136	156	157.2
February, 1932	139†	159	161.8
May, 1931	162	185	189.3
Last 5 yrs. high	184	206	210.4
Month	Apr. '29	Nov. '28	Feb. '29
Last 5 yrs. low	131	151	152.8
Month	May '32	May '32	May '32

*Computed by Albert S. Richey
†Corrected from issue of May 7, 1932.

In electric light and power there was a decline from 132 to 131 on the 1913 base taken as 100. Compared with this time of last year the drop amounts to 19 per cent; from the high point in April, 1929, the decrease is 29 per cent.

The movement of related indices, shown in the accompanying table and chart, was similar, but slightly smaller.

▼

Increased Lamp Imports from Japan

Exports of electric lamps from Japan to the United States for the year 1931 amounted to 61,915,718, valued at $1,202,672, according to a consular report quoted by the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce. Corresponding exports in 1930 were 35,078,618 lamps, valued at $999,584.

The increase amounts to 76 per cent in a year. The valuation per lamp is remarkably low, 2.84 cents in 1930 and 1.95 cents in 1931.

For comparison it may be stated that the number reported for 1931 is about one-sixth of the number of large incandescent lamps manufactured annually in the United States.

▼

New York Metal Prices

	May 25, 1932 Cents per Pound	June 1, 1932 Cents per Pound
Copper, electrolytic	5.33	5.25@5.33
Lead, Am. S. & R. price	3.00	3.00
Antimony	5.12½	5.12½
Nickel, ingot	35.00	35.00
Zinc, spots	3.225	3.25
Tin, Straits	21.00	20.75
Aluminum, 99 per cent.	23.30	23.30

Rate Reductions in Indiana Go On

Electric rate reductions for Laurel, Milton, Union City and Brazil, Ind., all served by the Public Service Company of Indiana, and Fortville, Ind., served by the Traction Light & Power Company, have been approved, in each case after negotiations between city officials and representatives of the company. A new tariff for Michigan City and nearby towns has been voluntarily filed with the Indiana Public Service Commission by the Northern Indiana Public Service Company. Hammond and East Chicago are among numerous other cities where official agitation for lower rates is rife.

▼

Rate Agitation in Dallas

An offer of the Dallas Power & Light Company to reduce its rates for electricity by 4 per cent to consumers whose bills exceed $2 monthly each has been rejected by the city. The proposed reduction would have amounted to approximately $225,000 in annual revenue, it was stated, but would have affected neither the basic 6-cent kilowatt-hour rate nor the 9 per cent rate of return the company is allowed by franchise. The city is expected to order a temporary rate which will effect a larger reduction and to move to bring about requisite amendments to the franchise.

▼

Rate Reduction by Flat Percentage

A rate controversy between the Ohio Edison Company and the city of Springfield, in that state, which began when the city commissioners endeavored to reduce the existing kilowatt-hour rate from 8, 6 and 3 cents to 6, 4 and 3 cents has ended with the acceptance of a counter proposal by the commissioners by which a 10 per cent discount will be given all consumers until the present franchise expires in November, 1932.

▼

Virginia Rates to Be Maintained

Scrutiny of all utility records for 1931 and 1932 is being made by the State Corporation Commission of Virginia, in accordance with legislative instructions, but substantial reductions in rates are not expected by those informed. Power companies especially have lost much business because of the shutting down of coal mines and factories. Although physical values of plants, equipment and land have fallen with all commercial values, losses appear to have kept up with this drop, with consequent lower figures for net return. The Corporation Commission has fixed rates in most cases at between 6 and 8 per cent of the estimated valuation. The last rate case heard, that of a water company, resulted in a tariff to yield 6.4 per cent.

—Courtesy Niagara Hudson News

ONE-TIME ELECTRIC LANDMARK DISAPPEARS

Used for many years on a fruit and dairy farm in western New York and the last to survive in that section, this wind-driven generator is being dismantled as the farm goes on the new Batavia-Alexander power line of the Niagara, Lockport & Ontario Power Company.

▼

Bridgeport Lights Up

Believing in extending rather than curtailing its street lighting, despite business conditions, Bridgeport, Conn., has put in operation a modern installation along Fairfield Avenue, which forms part of the Boston Post Road between New York and Boston. Mayors of many Connecticut cities were present at the official opening. The 250 new incandescent lighting units replace lamps of the old luminous-arc type. They are rated at 6,000 lumens each, have rippled glass globes and are staggered at 200 ft. intervals.

▼

Largest British Hydro Started

A contract has been let for the construction of a concrete-lined tunnel through the Galloway hills at Glenlee, Scotland, where the largest hydro-electric development in Great Britain will be built on the River Dee. The dam, of concrete, will be a third of a mile in length, and 140,000 hp. will be eventually developed. The hydro-electric stations will be connected with the national "grid" system.

New Wholesale Rates for New York

Notice has been given by the New York Public Service Commission to the electric companies of the Consolidated Gas Company group in New York City that they must be prepared by August 1 to submit new schedules for wholesale energy. The commission's action is in conformity with an announcement made some time ago that wholesale rates would be taken up for consideration as soon as residential and retail commercial rates were out of the way.

▼

Concord Refuses to Sell Plant

Citizens of Concord, Mass., refused at a stormy town meeting held last week to sell the municipal lighting distribution system to the Boston Edison company for $600,000. The generating plant of the town has been shut down for some time, energy being purchased in bulk from the new company substation, tied into the Lexington-Maynard lines. The town has until early in 1933 to accept the purchase offer, but two town meetings have refused to sell and it is unlikely that the system will change hands. The company will continue to supply energy.

▼

No Bids on Oregon State Plant

No bids to construct the 740-kw. Diesel power plant for supplying state buildings in and around Salem, Ore., were received by the State Board of Control at the expiration of the bid period last month. Doubt as to the method of payment for the plant was presumed to be the reason. Some prospective bidders sent letters stating the conditions under which they would bid. No new proposal has yet been made by the Board of Control. (ELECTRICAL WORLD, May 14, page 842.)

▼

Public Plants in British Columbia

As "threatening the whole stability of public utility operation in British Columbia," Lorne Campbell, managing director of the West Kootenay Power & Light Company, has protested before the executive council of the British Columbia Legislature against the plan of the city of Grand Forks to construct and operate a hydro-electric plant of its own. The company maintains that it has built up one of Canada's greatest power systems in this district and should be protected in its rights. This dispute, while relatively small in a financial sense and not related to large centers of population, brings the government face to face with a decision of major importance which may have a vital effect on the control of British Columbia's water power in the future.

Pennsylvania Operators Discuss Frequency Control

How automatic frequency regulation affects generating economies, the desiderata of tie-line loading regulation, problems arising in the simultaneous operation of different kinds of frequency regulators on interconnected systems, how much generating capacity should be under frequency control, contractual relationships and territorial influences on frequency regulation problems were among topics discussed at a meeting of the systems operation committee of the Pennsylvania Electric Association in Harrisburg late in May.

Time services and their relation to the regulation of automatic frequency were once more a topic of interest and manifest differences of opinion. Whether rigid or flexible control of frequency is desirable has yet to be agreed upon, but a new development described at the meeting consists in the production of a standard frequency said to have an error of less than one-hundredth of a second a day and secured by the use of a quartz crystal subjected to controlled atmospheric pressure and temperature. This development, first publicly broached before the A.I.E.E. at the winter convention, is still actively under consideration and may soon be made available by interests allied with the communication industry.

▼

Fritted Glass Filters Clean Transformer Oil

Recent experiments with glass filters indicate that greatly improved removal of sludge, at least as to the completeness of the removal, may be accomplished with this form of purifier. In the laboratory of the Jena Glass Works in Germany Messrs. Prausnitz and Obenaus have recently conducted a research to determine both the solid-body and water-content removing properties of fritted glass filters. These filters consist of type G-20, acid, alkali and salt resistant Jena glass ground to powderlike particles of a definite size for various porosities, heated to the sintering point without the admixture of any other substance and in this manner made into filter disks.

In the experiments with transformer oils is was found that the dielectric strength of both new and used insulating oil was improved by filtration through the glass filters, that some water-absorbing materials were also needed, that heating is desirable and that filters do not clog readily and may be easily cleaned. How far these laboratory tests can be converted to industrial application is, it is said by the investigators, largely a question of the manufacture of the proper filter device, and experiments on a larger scale are planned.

▼

Induction Furnace Melts 40-50 Tons of Steel Daily

Nearly twice the size of any previous coreless induction-type electric furnace, the installation recently made for a Chicago steel company by the Ajax Electrothermic Corporation has a production capacity of from 40 to 50 tons of low-carbon stainless steel daily.

Handling of 12,000 amp. at 1,000 cycles required the development of special busbars, some of the shorter of which are air-cooled while the heavy main buses carrying the furnace current are formed of water-cooled tubing interlaced to cut down induction. A 1,000-cycle motor-generator set, cooled with washed air, is used. The 4-ton furnace operates with a temperature rise in the housing of only a few degrees and then only where it comes closest to the coil.

▼

Air Conditioning Will Help Boulder Dam Work

A contract has been awarded to the Frigidaire Corporation to install air-conditioning equipment in the government administration building at Boulder City, Nev., following consultations between the Bureau of Reclamation and air-conditioning engineers. These consultations arose from last summer's experience at the Boulder Dam site, when much suffering was caused by blistering heat of from 105 deg. to 115 deg. F. "Naturally nothing could be done to lower the temperature of the outdoor air," said E. G. Biechler, president of the Frigidaire Corporation; "but we could give the key men on the project a cool and refreshing atmosphere for their offices and drafting rooms comparable to the invigorating summer climate of Colorado."

The compressor equipment used for the conditioning units is of the two-cylinder type. It is a development of the mechanical unit used in household and heavy-duty commercial products of the company. The extraordinary demands for the Boulder City installation required a margin of safety in refrigerating capacity that will be met easily by the superpowered units. The installation is the largest of Frigidaire air-conditioning units to be installed thus far. Units will be placed in the offices of the construction, field and office engineers, the district counsel and the chief clerk and also in two drafting rooms, two clerks' rooms, a stenographic room and two rooms so far unassigned. The condensing units will be installed in the service section of the structure, and the usual copper tubing lines will carry the refrigerant to and from the conditioners.

▼

"LINER" FOR BOSTON HARBOR TUNNEL IS ARC-WELDED

—Courtesy Lincoln Electric Company

Contributing to a saving of $1,000,000 over early estimates for the 31-ft. vehicular tunnel being built under Boston Harbor is the use of an arc-welded steel "liner." Each ring of the liner contains eleven segments or panels. On the 19,467 panels there are 132.72 miles of welding.

EDITORIALS

L.W.W.MORROW
Editor

California sets example in common-neutral practice

DISTRIBUTION has continued to resist efforts at economy while successful economies in generation, transmission, interconnection and management have made for lower electric rates. Network systems and standardized substations, it is true, have begun to show their contribution to reduced distribution investment. Pole and wire construction is, however, obstinate except in so far as reflected by the fluctuations in unit prices. But the use of a single conductor to serve simultaneously as a neutral for the secondary and a four-wire primary offers something in this province of the distribution system. Such savings as can be effected by the common neutral should not be regarded, however, as making a change of more than a few per cent in distribution outlay and an even smaller percentage in total system investment and cost per customer to serve.

In the recent trial of the system in California, culminating in a favorable decision by the Railroad Commission of that state, the reported savings, chiefly in copper costs, were in most instances based upon the change of an existing 2,300-volt, three-wire delta system to a 4,000-volt, four-wire system using a common neutral wire. The comparison properly includes the estimated cost of changing the existing system to a conventional four-wire system employing two neutral wires. The eventual picture will be that of conditions under normal growth of overhead four-wire distribution systems in which the capital invested in copper, insulators, pins and transformer cutouts may be expected to be from 75 to 85 per cent of that involved in using two neutrals.

The system appears to be applicable to best advantage in those fringe areas which have fairly high load densities but are still served by overhead lines because circumstances do not warrant underground construction with its much heavier outlay. Co-ordination with the telephone plant involves the same considerations as arise with multiple grounding of systems having separate neutrals. The success with which this co-operative and co-ordinated innovation was worked out and officially sanctioned in California can well serve as a model for other areas to imitate in extending its proved economies and merits.

Rates for energy shrink as consumption rises

THE thesis is maintained by many people that a straight rate reduction of itself will promote consumption in the same ratio as the rate change. This erroneous conception is based upon the principle that price alone will sell goods or services.

Recently figures from 53 companies in Illinois were used in an attempt to show that decreased rates alone accounted for a 9.5 per cent increase in consumption between 1929 and 1930. This conclusion is not valid. Accurate information on five utilities selected at random shows an increase in consumption of 11.1 per cent for the same period, and none of these had rate reductions. The argument that low price of itself sells is in the same class as the testimony of the college professors before the Wisconsin Public Service Commission to the effect that if utilities would lower rates the depression would be lightened.

Inducement types of rates as a supplement to sales effort and the creation of a demand from customers are aids in increasing consumption, but the cause and not the effect of rate reductions lies in increased consumption obtained by sales efforts and sales promotion. A straight-line rate reduction of itself will not increase consumption in the same ratio as the rate change. Evidence should now be available on several properties to show the normal saturation effect of rate changes on consumption with no aggressive sales efforts as the definite reason for increased business. The job of the industry is a selling job, and it cannot be avoided by a false assumption that price alone will do the selling.

Taxation to kill an industry

BROTHERLY love is hardly expected of congressmen in handling the affairs of their fellow men. The fellow men know too well the selfish objectives that motivate most of their acts. But at least the public has a right to expect that nursing of grudges, venting of spleen and general below-the-belt tactics would be set aside in a crisis. No one but an out and out antagonist of an industry would have tried to deliver the foul blow to the electrical industry that was incorporated in the tax bill rushed through the Senate Monday midnight. Utilities already pay from 10 to 15 per cent of gross revenues in taxes, and now comes this suggestion:

". . . a tax equivalent to 3 per cent of the price for which the power . . . sold, payable from net income but not otherwise." No mistaking this as a deliberate effort to force the payment out of net of a tax on gross. About the only industry that has anywhere near held to stability, the only one that could be looked to for a spurt of vibrant sales effort, is thus forced into retrenchment of operations and disbursements. The American people would be well capable of absorbing a 3 per cent tax on its bills. But no, a thoughtless Senator must have his last wallop. Net must be reduced to satisfy his venom. Thousands of investors associated with utility securities must be struck and public investment confidence in an industry that can go forward to bring back prosperity must be lowered. The tax is unsound and discriminatory. Let's hope the House will modify this provision, which now threatens to throttle a most hopeful agency for recovery just when it was getting up its old-time capacity for enthusiastic advance.

Consignment merchandising a questionable plan

ONE of the new ideas in merchandising involves the sale of appliances to utilities or other outlets on consignment, with other arrangements that tend to lower the costs and decrease the responsibilities of the sales outlets. The consignment method of doing business is not new, but its application to appliance merchandising under present conditions is very questionable.

It brings in an element of credit and of purchasing volume such that all sales outlets cannot buy on consignment, and this introduces the element of fair competition between outlets inasmuch as the smaller dealers cannot compete fairly with consignment dealers unless a full carrying charge for the consignment merchandise is paid by the larger outlets. A second difficulty lies in the fact that the small appliance manufacturer is limited in credit and in production and cannot upon a consignment basis do business on an equal plane with the large manufacturer.

Domestic market development has been brought about by using every effort to get the maximum number of sales outlets in each territory and to get these outlets to work in co-operation. Experience shows that this co-operation can be had only when manufacturers and sales outlets buy and sell under fair competitive conditions. Much progress has been made in clarifying present merchandising practices, and co-operation and good will have been increasing steadily, with a resultant improvement in sales to the market. Why introduce a new complication into distribution by the use of consignment merchandising?

Utilities and larger sales outlets have the money to buy appliances. Disturbing trade relations—even the elimination of utilities from merchandising—and price-cutting merchandising wars are certain to follow any selective use of consignment merchandising. It is not needed. It is a bad business practice unless carried out completely so that all sales outlets can use it equally well.

Common-Neutral Practice Confirmed in California

Results of several years' joint study.

Practice sanctioned by the California Railroad Commission.

Inductive effects measured for co-ordination, economic virtues and safety features embraced in the report.

Special practices of construction and maintenance set up to govern the co-ordination.

RESULTS of joint studies by power and telephone companies of the common-neutral system in California districts are now available. They confirm the scheme from the inductive, noise and safety standpoints and also point to some degree of potential economy in electrical distribution costs. The study of this and other multigrounded systems has been prosecuted by local companies for several years and also by the joint general committee of the N.E.L.A. and the Bell Telephone System. The California experience was correlated with that from other territories where the practice had been instituted earlier. The engineering staff of the California Railroad Commission participated in the local studies.

As a culmination to the intensive trial and observation the matter was submitted to the commission for ratification and this was granted in an order dated April 4, 1932. (See ELECTRICAL WORLD, April 23, 1923, page 720.) The order modified GO-64A to the extent of eliminating the previous requirement that the primary neutral shall be treated as a phase wire and by incorporating the requisite clauses in the existing rules to provide for the common neutral under limited conditions and practices. The permission applies only to three-phase, wye-connected, four-wire primary circuits of voltages which are not over 5,000 between phase conductors.

Two neutrals an unneeded duplication

The carrying of two wires on poles—one for the primary and one for the secondary neutral—both at ground potential but separated and insulated from each other, has appeared to be a needless duplication, and in the past ten or twelve years they have been combined in one wire in a number of localities.

But the overhead electrical construction rules of California (General Order No. 64 of the Railroad Commission) required that any neutral wire be treated as a phase wire of the voltage of the circuit to which it pertained. This meant that the primary neutral wire had to be carried in the primary position with the same insulation as the primary phase wires, and the secondary neutral wire in the secondary position with secondary insulation.

When a revision of General Order No. 64 was under consideration a number of the power companies of California requested the Railroad Commission to modify the provisions of the rules to permit the use of a common primary and secondary grounded neutral wire on four-wire distribution systems less than 5,000 volts. At that time the report on the Minneapolis studies had not yet been published, so little information was available regarding the inductive effects involved in joint use. The question of safety of the common neutral, as well as other types of distribution systems, had been raised in some quarters and had not been analyzed. No joint economic study had been made to determine the possible savings after all necessary measures had been taken to care for possible increased induction. For these reasons the modifications requested were not granted at that time, but it was agreed that an investigation should be made by the interested utilities into the economies and safety features involved, upon which recommendations could be made.

Twenty-five areas in the studies

The local power and telephone companies, with the assistance of personnel from the American Telephone & Telegraph Company and the National Electric Light Association, conducted such studies from November, 1927, to December, 1928. Fourteen substation areas in the northern part of the state and eleven areas in the southern part were offered for consideration. After some preliminary investigation it was decided to base the work on the study of eleven areas.

An attempt was made at first to evaluate through a number of years the savings which would be made on the power system and the costs which would be incurred on the telephone system to secure satisfactory co-ordination in these areas. It soon became apparent that while the savings in cost could be calculated on existing routes and exposures with percentages applied for growth, a reasonable amount of co-operative planning between the two systems would substantially reduce the amount of the exposure. It was also evident that with the use of suitable practices in both the power and telephone plant, and with a provision for the mutual working out of special problems, the costs of co-ordination could be substantially reduced. As a consequence of this, it was decided, instead of submitting a report on the uncertain over-all economies, that a set of trial practices for inductive co-ordination be adopted by the power and telephone interests to cover installations using the common-neutral system of distribution. These eleven areas were cut over from three-wire to four-wire, using

the trial practices in order to obtain data as to the economies and experience with the effectiveness and practicability of the practices.

Savings greatest in loaded areas

In general, the greatest savings in power company distribution costs are realized in areas which are well built up and have high load densities, the least savings in sparse areas having low load densities. The savings in practice were reduced in some areas due to the necessity of changing the neutral wire, formerly the secondary neutral, to a larger size to conform to the special construction rules laid down by the commission. Other factors varied considerably in the different areas.

After the common neutral has been established in an area for a number of years the savings should be in more constant proportion to the existing distribution capital than the varying results of the reported cutovers suggest. The savings come under the following headings:

Copper, pins and insulators, from 14 per cent (one wire out of seven) in three-phase portions to 20 per cent (one wire out of five) in single-phase runs.

Neutral dead ends, 50 per cent.

Fuse cut-outs, 50 per cent.

Pin position, indefinite, but it has a value, for in some cases reconstruction of an arm or even a pole is avoided or deferred.

It is evident that the savings are chiefly in copper costs and thus should be viewed in their true relation to distribution capital. To be deducted from these savings will be the cost of establishing extra grounds on the common neutral, in excess of those which would be required on the two-neutral multigrounded system.

Experience with the inductive co-ordination practices during the trial period indicated that it was practicable to secure co-ordination with telephone exchange plant in cable and common-neutral distribution system of not over 5,000 volts between phase conductors. The costs of continuing administration are difficult to evaluate, but from the experience thus far it is believed that they will not have a large effect on the over-all savings indicated.

Principles of practice framed

The practices in their present form, which have been amended slightly from their trial form on the basis of experience, in addition to providing for co-operative advance planning, are in part as follows:

3.1 *Transformers in General*—Transformers should not be operated at voltages in excess of 110 per cent of normal rating.

3.2 *At Substation Supplying the Distribution System*—Substation areas should be supplied by Δ-Y connected transformers, or Y-Y connected transformers with tertiary deltas of suitable size, or other arrangements which will effectively limit the amount of triple harmonics.

Banks of substation transformers should consist of three electrically like units, except in case of emergency.

When an alternator or motor is to be operated with neutral grounded and electrically connected on the distribution side of the station transformers, or on the high-voltage side if the transformers are connected Y/Y without tertiary delta, suitable means should be taken, either in the design or external to the machine, to reduce the triple harmonics as far as may be necessary and practicable.

3.3 *On Lines of the Distribution System*—When transformers supplying three-phase loads are connected Y-Δ, the neutral point on the high-voltage side should be isolated if the substation transformers are connected Y-Y. If the substation transformers are connected Δ-Y or Y-Y with tertiary delta, the neutral point of the load bank should, where practicable, be connected to the neutral wire.

3.4 *Balance of Phases*—Every effort shall be made to keep the unbalance of phase currents in circuits involved in inductive exposures as small as practicable.

The current in single-phase branches involving one-phase wire and neutral should, wherever practicable, be kept below 25 amp., and in no case should it exceed 50 amp.

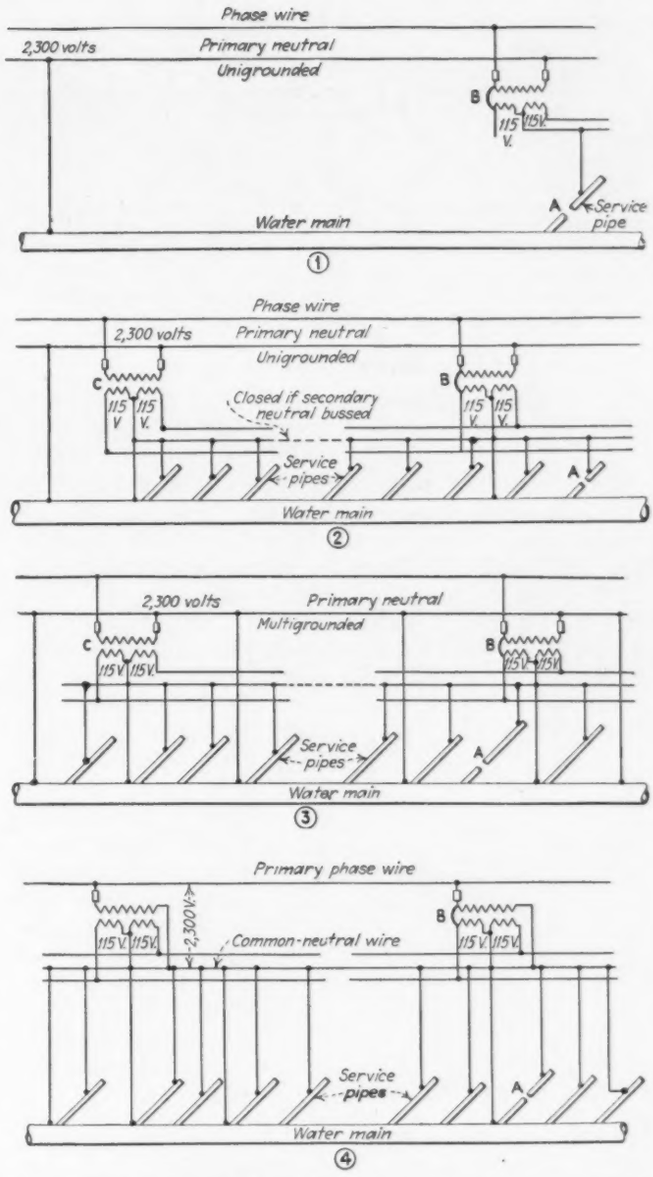
When open star branches feed loads connected between phase wires and neutral the total resulting neutral current should not exceed the values specified for single-phase branches.

Successive single-phase or open-star taps should be arranged to secure the best practicable balance on the feeder. At the time of peak load the unbalance at the substation should not be more than 50 amp., determined vectorially.

3.5 *Continuous Neutral*—The neutral shall be a continuous metallic conductor of adequate conductivity on the same poles as the primary phase wires throughout the common neutral or multi-grounded area.

It is recognized that grounding is for the purpose of stabilizing the neutral and not for the use of the earth as a return conductor.

4.1 *Cables*—Telephone cables of standard modern design and



Figs. 1 to 4—Comparison of three customary systems with common-neutral with transformer breakdown and water-service pipe disconnected

1. Single service ground at end of unigrounded primary run.
2. Two-neutral unigrounded system in California.
3. Two-neutral, multigrounded system.
4. Four-wire common-neutral system.

as well balanced as is practicable, both metallically and to ground, should be used.

In inductive exposures the cable sheath should be continuous and grounded at both ends of the exposure, where necessary and practicable. The ground connections should be of sufficiently low resistance to give effective shielding and should be made to large underground cable system or to water pipes where available.

4.2 *Central Office and Subscriber Set Equipment*—Central office cord circuits or other types of interconnecting units and subscriber station sets should be balanced as far as is practicable, in accordance with standard modern practice. In special cases consideration should be given, so far as necessary and practicable, to the use of high impedance substation party-line ringers or other measures for reducing inductive effects.

Safety is assured

Safety of the proposed common-neutral system was looked into and an analysis was presented to the commission. The investigations of the Bureau of Standards given in Technologic Paper No. 108 and data on ground resistances measured in the various areas considered were drawn upon in making this analysis. Figs. 1, 2, and 3 indicate the connections which exist under present systems of distribution compared with those which would exist under the proposed system (Fig. 4) in case of a breakdown between phase wire and neutral coincident with operations on water piping in buildings served by both. As pointed out in the Bureau of Standards publication, a single service from a single transformer on the end of a two-wire run with ungrounded neutral (Fig. 1) gives rise to a dangerous condition. If the water service is opened at *A*, a breakdown between primary and secondary at the transformer *B* (or between phase wire and neutral on the line) might cause a dangerous potential to exist across the open joint at *A*, or between the plumbing above the break and that below or gas pipes, basement floor, etc.

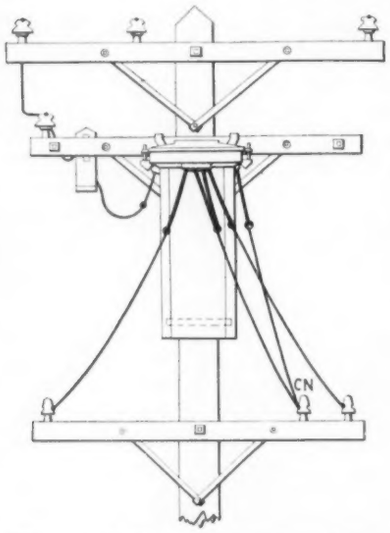


Fig. 5—Primary neutral omitted
Outgoing primary lead from transformer tied to secondary neutral.

In the ordinary two-neutral, unigrounded primary system (Fig. 2) the secondary neutral is grounded at each transformer, in California, and at each service whenever possible. Multigrounding of the primary neutral (Fig. 3) has been necessary on underground runs, and the practice has been extended to overhead feeders in recent years.

In all except Fig. 1 it is evident that, with the multiplicity of grounds existing, an opening in one waterpipe service (*A*) cannot be dangerous in case of a breakdown between primary and secondary of a transformer (*B*) or between phase wire and neutral.

The question was raised as to the safety of the common-neutral system in case of a break in the neutral wire. From the same diagrams omitting transformer breakdown at *B* the conditions in case of an opening in the neutral conductor can be analyzed. In the unigrounded system (either Fig. 1 or 2) any transformers beyond a break in the primary neutral would be rendered inoperative. No dangerous voltage could exist on the water piping, even in Fig. 1, until a breakdown occurs at the transformer and the water pipe is disconnected. In Fig. 2 even the three occurrences if coincident would not lead to a high voltage across the opening *A*, because of other secondary service grounds in the vicinity.

In the two-neutral multigrounded system (Fig. 3) the transformers beyond a break in primary neutral would still operate, as a return path is provided through the secondary neutral in combination with the ground system. In the common-neutral system (Fig. 4) in case of a break in the neutral, here the only one, more dependence is placed on the ground system to shunt the open section, but no single open water service would give rise to a dangerous condition.

Low ground resistance essential

In the preceding discussion only elements of the various systems have been treated. In the normal case the many transformers each with their ground connections, the many services from each with their respective ground connections and the grids of neutral wires and of water mains, usually existing, result in safety conditions in which the distribution engineers concerned have considerable confidence.

Fundamentally what is needed for safety is a low resistance from any point on the neutral conductor to the ground connection at the wye point of the transformers at the substation. It does not matter whether this is maintained through uniformly low-resistance ground connections or through definitely continuous overhead conductors or networks of conductors. Local soil conditions affect ground resistances greatly, and in some areas the desired 3½-ohm resistance cannot be consistently met on individual grounds, though the neutral grid as a whole can be kept within that limit. Where low ground resistances are not obtainable an alternative of a low-resistance path back to the substation ground is permitted, with the provision that this shall have a lower resistance than any individual ground on the line, and in no case more than 2 ohms.

In southern California it is a common practice to install the primary wires on one end of a crossarm, the secondary wires on the other. In this type of construction the common-neutral wire is carried preferably on the secondary neutral position. In the north separate arms are the rule, the common neutral here taking the neutral position on the secondary arm, giving a slightly wider loop.

The construction rules applying to the common neutral as prescribed by the commission are in the form of a supplement to its existing General Order No. 64-A relating to overhead line construction. At present they are thought to be a little conservative in the interest of safety. As experience is gained the burden of some of the provisions may be lightened and greater savings effected. An important feature of the grant is the leaving of the inductive co-ordination between the companies involved under the general provisions of the present General Order No. 52 and the detailed provisions of the "practices" agreed to by the power and

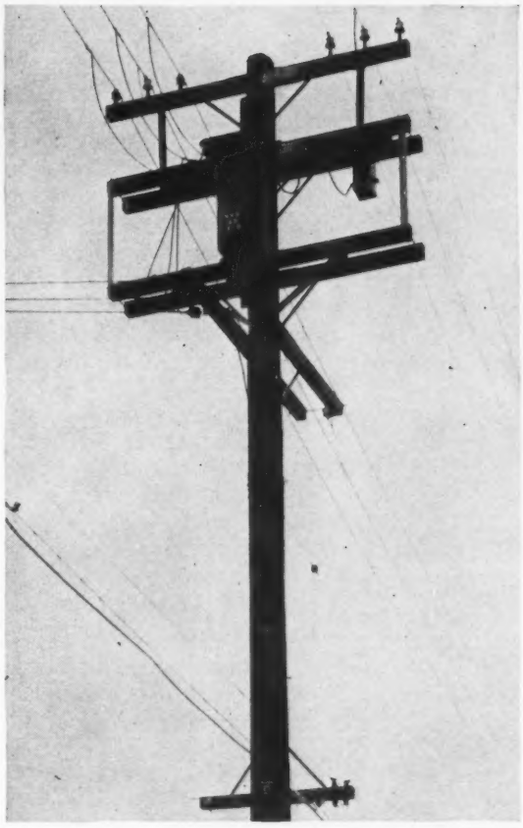


Fig. 6—Six wires suffice for four-wire primary and three-wire secondary

Three primaries on the right, secondaries on the left.

telephone interests, these practices being subject to modification only by mutual agreement of the two interests as experience may indicate the need.

Neutral grid desired

Besides the low-resistance requirement mentioned, the construction rules require the formation of a neutral grid wherever practicable, having two or more return paths to the source of supply such that a break in one will leave combined paths of adequate conductivity. Grounds on the neutral grid are to be at intervals not exceeding 1,500 ft., those on branch runs at intervals not exceeding 800 ft. The common-neutral line conductor is to have a minimum area of approximately 50 per cent of the largest related primary phase conductor. The normal position for the common-neutral conductor is recognized to be in the secondary space. When for any reason it is carried in the primary space, or if the primary neutral is connected to the secondary neutral, it must be designated by a tag maintained at each pin position on the primary line and buck arm. Driven grounds must be at least 2 ft. from the pole, and horizontal runs from pole to ground rod must be No. 1 copper as a minimum and installed at least 1 ft. under the ground surface. On a branch circuit, unless there is a loop return on the neutral, each transformer must have one or more metallic water pipe system grounds of not over 3.5 ohms resistance on each side of the installation. Where this is not feasible a separate primary neutral wire, ungrounded, may be carried. As permitted in present two-neutral construction, ground connections for transformers may be at the transformer pole or at an adjacent pole, but in the common-neutral system the resistance must not exceed 3.5 ohms.

▼

Guarding Against Loss of Field

By E. H. BANCKER

Central Station Engineering Department, General Electric Company

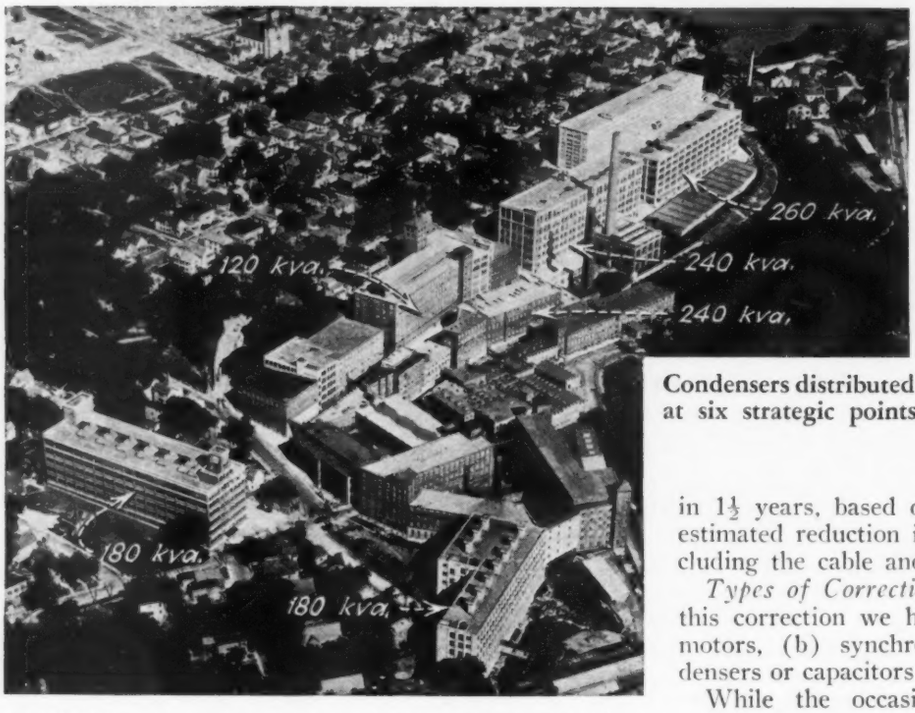
Occasionally something will happen to remove field from a loaded alternator operating in parallel with others and it has been found that it is usually possible to reclose the field without any ill effects. In a recent A.I.E.E. paper the authors cite 34 known instances in which the field circuit was reclosed without any difficulty. On the other hand, long-continued operation without any field might result in serious rotor overheating and it therefore becomes desirable to know immediately when the field circuit of a loaded generator is interrupted. Uusually it can be re-established by closing either the regular or spare excitation field switch without any other activity on the part of the operator.

There are many ways in which loss of field may be detected, but the simplest method is the use of an undercurrent relay to give an alarm whenever the field current drops below its setting. Certain external conditions in the alternated-current circuit may cause temporary fluctuations of field current, which make it advisable to incorporate a time-delay action in the alarm circuit. It is also true that under conditions of leading power factor operation, such as line charging, it may be necessary to reduce the field current to a small fraction of its normal value. However, when this condition obtains, the operator is aware of the fact that the field current is less than normal and may disconnect the alarm circuit in case it is below the drop-out point of the undercurrent relay.

The alarm circuit is interlocked with an auxiliary switch on the oil circuit breaker so that the alarm will be sounded only when the circuit breaker is closed and the field current is reduced. A tumbler switch is arranged so that if it becomes necessary to disconnect the alarm the audible signal will be disconnected, but the visual one will remain. This switch can be double throw and so connected that if the field current again becomes sufficient to pick up the relay and the operator fails to return the switch to reset the alarm the bell will again ring until he does so. This insures that any subsequent reduction in field will give the proper alarm.

The under-current relay used should have a normal current rating equal to the full rated field amperes and may be of any type suitable for this service. Because in operating it merely gives an alarm, there is no danger in utilizing a relay operating from a shunt, since the failure of the shunt lead will not cause a disconnection of the machine. The relay should be designed to pick up at 35 per cent of its rated current or less and drop out between 15 per cent of rating and its pick-up value. An adjustable time-delay relay may be used to prevent transient phenomena from giving an alarm when it is unnecessary.

Capacitors to Save Cost in Less Than Two Years



Condensers distributed at six strategic points

By E. WADSWORTH STONE
Research and Consulting Engineer
Bigelow-Sanford Carpet Company, Inc.

LIGHT and varying loads maintained during the last year and a half at the Amsterdam plant of the Bigelow-Sanford Carpet Company, Inc., served to emphasize the effect of the high ratio of demand to energy charge, the effect of fluctuating schedules on the cost of power and the lower power factors obtained in supplying several of the operating departments. A proposal to rearrange several operating departments promised to complicate further the overloaded conditions of some circuits and feeders. Even at full load it appeared that the plant power factor would not exceed 75-78 per cent.

Incoming power is received at 13,200 volts, 60 cycles, three phase and stepped down through our own equipment, comprising two banks of transformers (one of three 1,667-kva. units and the other of three 333-kva. units). It is then distributed through our own switchboard, substation and an underground cable system at 600 volts to the several plant buildings. These have a floor space approximating 44 acres and cover a ground area of about 27½ acres. Lighting service is handled through additional step-down transformers located under ground at convenient points.

Preliminary Survey and Needs—Preliminary determinations indicated circuit power factors ranging from 47 to 93 per cent with plant power factors approximating 75 to 78 per cent. Large numbers of small motors for individual drive and large motors operating at times at low load factor contributed to bring this about in spite of previous attempts to balance motors to connected loads. Low voltages at distribution line ends affected lighting and some cables were loaded to a safe limit.

Further study indicated that capacitor or other corrective equipment to the amount of 960 kva. should give a plant power factor of 95 per cent, with a corresponding improvement of the several circuit power factors to 90 per cent or better.

The apparent saving indicated amortization of the investment in 1½ years, based on normal plant operation and the estimated reduction in total demand charge, but not including the cable and transformer losses.

Types of Corrective Equipment Available—To make this correction we had the choice of (a) synchronous motors, (b) synchronous condensers, (c) static condensers or capacitors.

While the occasional substitution of synchronous motors or synchronous induction motors seemed possible in lieu of steam turbines or standard motor drives, the corresponding corrective effect was but a small percentage of that required.

A synchronous condenser located at the substation was next considered. The correction could be made by one or two units. The investment was somewhat less than for static condensers or capacitors, as they are called, but the operating cost promised to cut the profit expected to result from their operation materially. Some engineering service and upkeep also seemed necessary, so that, considering installation and operating costs together, there did not appear to be the economy usually associated with this class of equipment. In addition the power-factor correction would be applied at the substation and would not help to reduce cable loading or line losses.

This last-mentioned factor also applied to capacitors located at the substation. Our choice, therefore, centered on units of sufficient size or kva. capacity located at the local distribution panels where a circuit enters a building. Connecting them ahead of the local building distribution equipment and to the main cable system made it possible to obtain the corrective effect of each capacitor unit, just as though it were located at the substation, even though its local load was disconnected.

Capacitors Inherently Adaptable—This arrangement made possible the following:

1. Maximum total plant power-factor correction at all times.

2. Maximum circuit power-factor correction for all connected loads.

3. Better voltage regulation with a tendency to eliminate feeder voltage drops resulting from poor power factor.

4. Minimum cost consistent with flexibility of use.

5. Periodic check of unit capacity, with circuit load disconnected, using the corrective effect to check total capacity and verify the number of cells or portions of cells working.

6. Operation could be checked from the substation board. This is important for the nature of capacitors is such that once installed the tendency is to forget them.

7. Operating expense and maintenance were practically nil (usually not to exceed one-quarter of 1 per cent) compared with the synchronous condenser and associated equipment.

8. Unit circuit breakers offered protection from unusual line surges and overloads.

9. In the event that departmental loads changed radically, due to rearrangement or unusual conditions, additional cells could be added readily or equally transferred to another location.

Improvements Observed in Capacitors—Capacitor equipment is made by a limited number of manufacturers, but our investigation promptly indicated that all were to be congratulated on the quality of their product and the improvements that they had made looking to:

1. Protection from voltage surges and overload conditions through fused cells, fused cell units or bank circuit breakers.

2. Elimination of the usual manufacturing defects, including both complete assembly and component parts.

3. Improved insulation, both paper and oil.

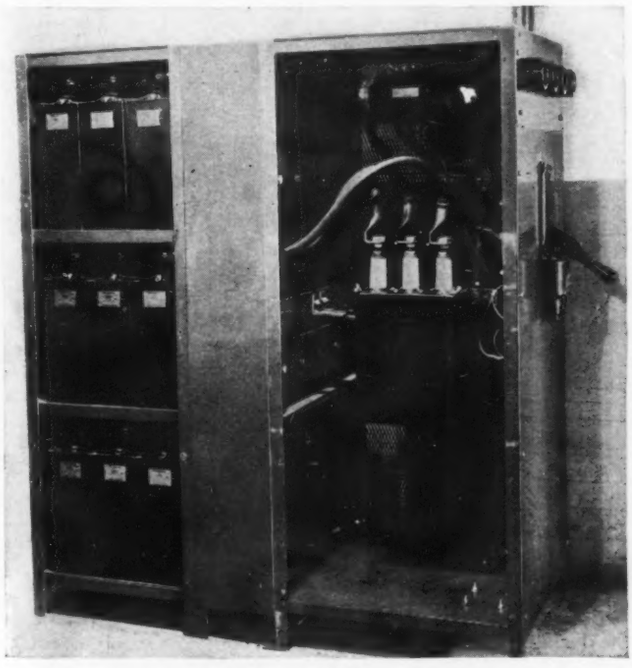
4. Elimination of oil leakage.

5. Methods for test and check.

6. Strength of both cells and component parts.

7. Standardized construction.

8. Increased capacity at lower cost and less space per kva.



One of five capacitor-and-breaker installations composed of 10-kva. cells

9. Cleanliness in manufacture.

10. Conservative rating.

All of these achievements have helped to produce capacitor units of greater electrical and mechanical strength, eliminate breakdown before and during customer service, minimize damage in event of accidental breakdown, lower the installed cost per kva. and minimize operating cost.

Results Obtained—The calculated capacity, 960 kva., was purchased in five units: one 120 kva., two 180 kva. and two 240 kva. Each had its own circuit breaker and was made up of 10-kva. cells mounted on a steel framework with wire mesh inclosure. These units, together with previous installations, brought the total corrective equipment to 1,220 kva. The installation was made by our own plant electricians and has now been in operation more than seven months. During that period the plant power factor in per cent has been: August, 97.6; September, 97.6; October, 97.6; November, 97.5; December, 100; January, 100, and February, 99.8.

Apart from a substantial reduction in cable and transformer loss due to reduced demand and energy charges, the saving has been such as to indicate payment for the investment in one year and ten months, based upon power factor improvement from 80 per cent, and one year and eight months when figured from 78 per cent. The plant power factor tends to increase for light loads and maintain a constant figure for medium and normal loads.

In the event that it is later decided to generate a substantial portion of our electrical energy as by-product power, this power-factor correction will prove especially advantageous in reducing the installed capacity to a minimum.

There is every indication that the system will prove as flexible in meeting new or changed electric load conditions as anticipated. Actual operation indicates that the expected power-factor correction will be equaled or exceeded, that voltage regulation is better, and that the return on the investment closely approximates the estimated figure, even under light and varying plant load factors.

The success of this installation had led us to consider seriously the use of power-factor equipment at our Thompsonville and Clinton plants, where we manufacture our electrical energy rather than purchase it from outside sources as is the case at Amsterdam.

▼

Boston's Branch Libraries Feature Modern Lighting

Through the branches of the Boston Public Library progress is being achieved in a gradual modernization of illumination which it is hoped will ultimately extend through all buildings and departments of the city's service. The latest to be erected is the Faneuil branch. Designed in a modified modernistic motif, the lighting system employs 300-watt Holophane "Filterlites" with specially made chromium fittings and hangers. The entire interior is lighted with a uniform intensity of 10 to 12 foot-candles. A slightly higher level is maintained at the delivery desks, above which is a false skylight equipped with sixteen concealed 60-watt lamps.

Voltage Survey Points to Closer Feeder Regulation

By L. F. KOONTZ
Central Station Engineering Department, General Electric Company, Schenectady, N. Y

RECENT voltage surveys indicate that many distribution feeders in operation today may have wide variations in the voltage delivered to customers. Furthermore, the method of checking voltage in common use not only does not show up such variations but may even be misleading. These surveys were made for the purpose of obtaining data that might bring about a better understanding of a number of problems in connection with the design and operation of lighting feeders and the correct application of induction voltage regulators. Some of these which will be considered here are:

(a) How close the average residential lighting customer's voltage is maintained to nominal value both during the evening load period and at light load periods.

(b) The most important causes of variations in customer's voltage.

(c) Whether or not regulators are generally adjusted to give best results.

(d) Effect of voltage on power consumed.

To gather data bearing on these problems, four feeders, three in one city and one in another, were studied with recording instruments during 1930 and 1931. They supply house lighting, street lighting and small power loads such as household appliances, small pumps and other fractional-horsepower motors, with house lighting by far the most important.

The charts taken together with primary and secondary layout maps, circuit constants, conductor sizes and spacings, regulator settings, etc., constitute the body of the data collected from which the results shown and conclusions reached in the following paragraphs are taken:

Relatively large variations disclosed

The data on problem (a) consists of the voltage charts from the twelve portable voltmeters installed successively at customer's premises on the four feeders. It appeared from these that customer's voltage was generally below nominal during the evening load period and over a period of 24 hours might cover a range as great as 25 volts, with about 10 volts variation representing an average.

The following tabulation made up of readings from feeder *A* is an example of variations in voltage supplied customers on lighting feeders during the evening load period. In it are given the high, low and average voltages recorded during the hours from 8 p.m. to 11 p.m. at each of the twelve customers' service switches where meters were installed on feeder *A*. The average values were obtained from the voltage charts and are based on area under the voltage curve for three hours. Nominal voltage on this feeder is 120.

Location on Feeder A	Customer's Voltage High	Low	Average	Location on Feeder A	Customer's Voltage High	Low	Average
1	125	118	122	8	119	113	115
2	124	116	120	9	122	108	117
3	122	106	112	10	122	113	116
4	123	118	119	11	124	109	115
5	125	110	117	12	120	106	113
6	121	107	114				
7	120	110	115.5	Average.....			116

These readings were taken during the last of April after daylight saving time and thus do not represent either extreme of seasonal variations. They should represent the entire feeder fairly well since the five secondaries which supply these twelve customers were selected so that one was at the approximate center of distribution, one was supplied by the first transformer from the substation and the remaining three were at the ends of the main primary branches as shown in Fig. 1. It should be understood that this tabulation does not show the extreme voltage conditions on the feeder, since many lower voltages were recorded at other points and the highest voltages were recorded during the early morning hours.

Voltage found low at lighting peak

Some variations in customer's voltage over a 24-hour period are shown in Figs. 2 and 3. These graphs are copies of the original charts made on a greatly increased time scale. They are intended to give some idea of

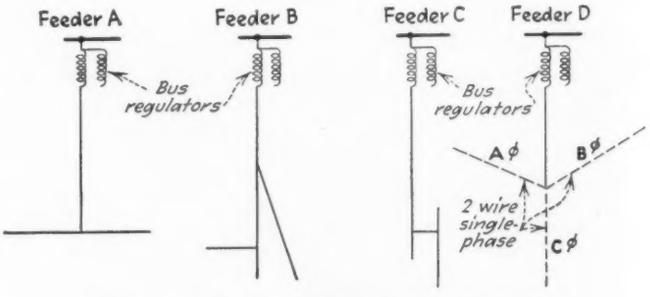


Fig. 1—These were the feeders studied

All are three-phase, four-wire; D has single-phase radials. See Table I for details of voltages, ratings and loads.

On feeder A recording voltmeters, wattmeters and ammeters of the seven-day strip-chart type, Warren-motor driven at 3 in. per hour, were used. Approximately 80 instruments were installed throughout the feeder and simultaneous charts obtained over a period of three weeks. On feeder B twenty recording voltmeters of the same type were used, but no ammeters or wattmeters installed. Continuous charts for three weeks were obtained. Feeder D was studied with the same number and type of instruments for four weeks. A more elaborate survey was made of feeder D than of either B or C. Thirty voltmeters and three watt-hour meters were used and readings of feeder current regularly taken over a period of five consecutive weeks.

Altogether, from the four feeders about 430 strip charts were obtained, each 60 ft. long and covering a period of one week. All except about 50 are voltmeter charts. These 50 are made up of about 25 ammeter and 25 wattmeter charts.

actual variations encountered and are not extreme conditions. This point is brought out by the distances in pole spans on each graph, indicating how far the meter was from the transformer pole. Some of the important points brought out by the graphs in Fig. 2 are:

1. Voltage falls as far below nominal as 18 volts during the evening load period and is more than 5 volts below at this time on all of the four graphs.

2. In all but the first case (feeder *A*) the nominal system voltage would be closer to actual conditions if it were lowered 5 volts.

3. The effect of the evening lighting load peak is very pronounced. The effect of voltage on quality and quantity of light from incandescent lamps is well known. These graphs, therefore, show that voltage is generally low just at a time when it would be most advantageous to customer and operating company to have it up to nominal.

The question which naturally follows is what causes were found for the low-voltage condition which appeared to exist throughout each of the four feeders by the records of customer's voltage obtained. Simultaneous charts of primary and secondary voltages from customer back to substation are required to get an answer to this. Such charts were obtained on all feeders studied and when analyzed from this viewpoint indicated that voltage drop in the secondary circuits is the most important cause and such factors as inaccurate regulator settings, too low regulator capacity, overloaded transformers and primary lines are contributing causes.

Voltage has effect on energy consumption

Fourth is the problem of effect of distribution system voltage maintained on the power used; that is, how voltage affects power. There is considerable difference of opinion on this point with very little accurate data. Some contended that if the consumer's voltage is maintained consistently below nominal, power used will not be correspondingly reduced because a greater number of lights will be used. Others that, if the voltage is maintained at any value less than about 15 volts below nominal, the power used will be reduced according to the well-known characteristics of tungsten lamps, since such lamps form by far the most important single item of load.

To get a better idea of the effect of voltage on the power used, some recording wattmeter readings were taken on feeders *A* and *D* along with the voltage studies.

Table I—Data for Feeders Shown in Fig. 1

Feeder	A	B	C	D
Current rating, amp.	200	150	200	200
Voltage rating:				
Primary	2,160/3,750	2,160/3,750	2,160/3,750	2,100/4,150
Secondary	120/240	120/240	120/240	115/230
Regulator rating:				
Current, amp.	150/300	150/300	150/300	200/400
Range, per cent	20/10	10/5	20/10	10/5
Kva.	72	34.5	72	48
Area supplied, sq.mi.	1	1.3	0.625	6
Load density (transformer cap.) kva./sq.mi.	1,400	900	3,400	245
Distribution transformers:				
Kva.	1 400	1,163	2,098	1,472
Number	81	130	108	207
Average kva.	17	9	19	7
Type of area	Average Residential	Good Residential	Concentrated Residential	Poor and Average Residential

1. The importance of good voltage regulation to customers is generally well recognized.

2. Methods commonly employed to check feeder voltages are not adequate to give a good picture of general voltage conditions and the results may even be misleading.

3. A more elaborate routine is suggested.

4. Voltage variations would be much greater on any of the feeders studied if regulators were not used, even on feeder D, which is loaded to only about 40 per cent of capacity of primary lines.

5. Feeders operating without regulators, even though lightly loaded, may have wide variations in customer's voltage due to bus voltage variations and secondary drop.

6. Regulator settings should be determined by consideration of general feeder voltage.

7. Induction voltage regulators are the only devices used extensively to regulate lighting feeders.

Years of experience indicate their reliability and that they are an indispensable part of most lighting feeders. As no supplementary regulating equipment is yet available, the emphasis should be on their correct application (adequate capacity, range, and setting) and on careful feeder design, particularly secondaries. Work along these lines seems to present the greatest possibilities for improved voltage conditions on such feeders.

On feeder *A* charts were made of watts and amperes at the substation and of regulator voltage (feeder side) on each phase, with the regulator line drop compensator alternately put in and out of the circuit. The effect of the resulting sudden change of feeder voltage, both up and down, is seen in Fig. 6. The most important point to be noted is that such changes affect current and watts but little during the light load periods, but during the evening peak the effect is much more pronounced. There can be but little reasonable doubt that such sudden changes will produce the effect shown, but these charts do not prove that over a period of time voltage maintained below nominal will produce a corresponding decrease in power used.

To help clear up this particular point, feeder *D* was operated for a period of a week regulated as usual and then operated without regulation for the following week, taking simultaneous readings of kilowatt-hours and regulator (feeder side) voltage. The results are given in the caption and sketch of Fig. 7. An analysis shows that on phase *B*, where the bus voltage is normally lower than the outgoing regulated feeder voltage during the evening load period, the kilowatt-hours supplied during the first week of regulated operation is definitely greater than the following week of unregulated operation. These two weeks had the same number of clear and cloudy days.

These charts and data are hardly sufficient to prove this point conclusively, but are much more likely to be

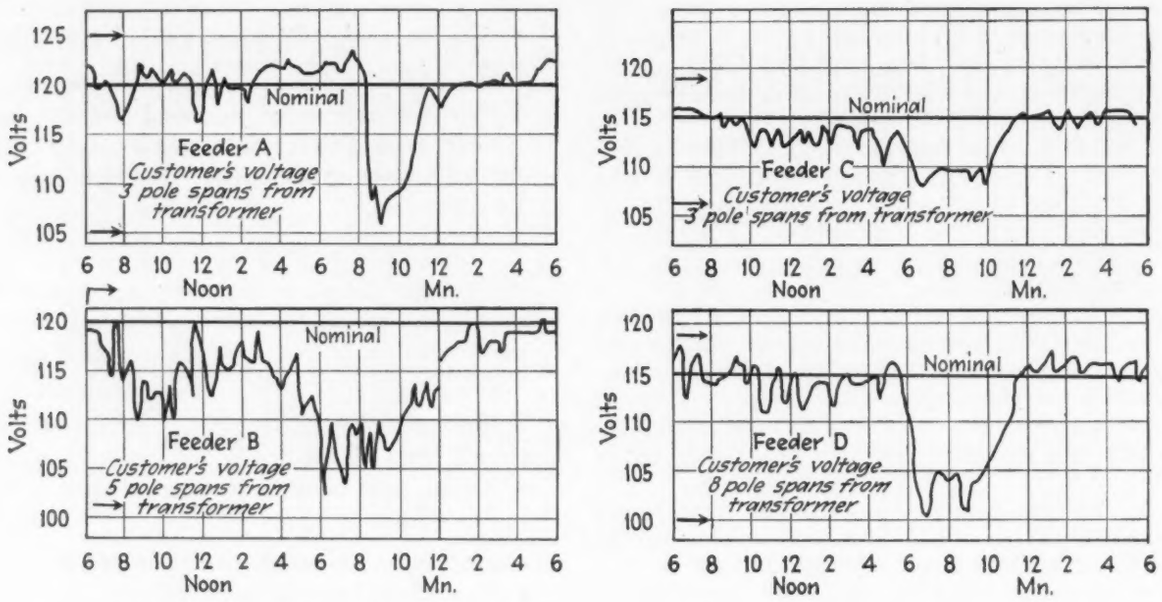


Fig. 2—Considerable variation in customer's voltage

Variations in voltage delivered to lighting customers over a 24-hour period as measured by eight-day strip-chart recording instruments. The arrows show highest and lowest voltage recorded for the week. The length of secondary lines from voltmeter to transformer pole is given on each chart in pole spans. These charts were selected from twelve obtained on each of the four feeders to show what might occur undetected.

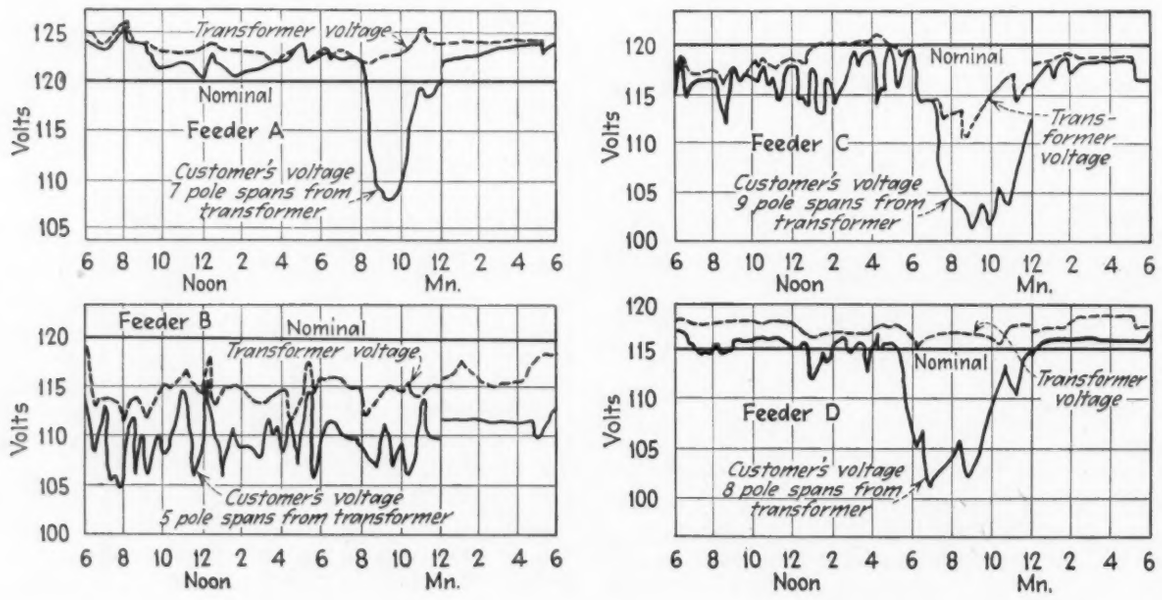
true than calculations or mere speculations. It is furthermore, from the very nature of the problem, doubtful if it can be proved conclusively. It is not possible to operate one feeder at two voltage levels at the same time, and so whenever a comparison is made between the power used over a given period at one voltage and over an equal but different period at another voltage the effect of such important variable factors as weather, load changes, etc., will be largely to decrease its value.

The results of these surveys, therefore, appear to answer the questions listed in the second paragraph somewhat as follows:

1. Residential lighting customer's voltage may vary from the nominal value as much as 15 per cent. The tendency is for the widest variations to occur during the three or four hours of the evening load period. Voltages are generally below nominal rather than above. Under prevailing conditions the voltage delivered to average lighting customers may be expected to vary nearly 10 per cent between peak load and light load periods.

Fig. 3—Voltage drop in secondary circuits

Cases of variation in customer's voltage due largely to secondary line drop. Dashed line shows transformer voltage and full line customer's voltage recorded simultaneously. Distance from recording meter to transformer is given in pole spans.
In each case the meter was located closer to the transformer than the end of the secondary circuit. It should be noted, however, that while the difference between the full line and dashed line is due to secondary drop only, the variations in transformer voltage shown for feeders B and C (dashed lines) are due to transformer and primary drop.



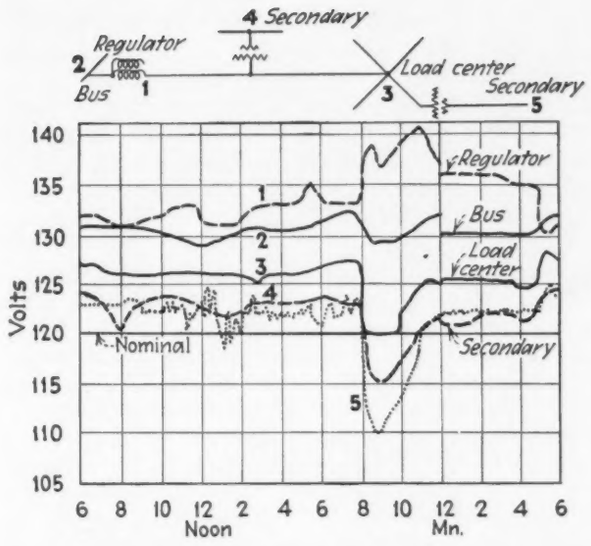


Fig. 4—Voltage drop from substation to load center

Voltage distribution from substation to customer along one phase of feeder A for a particular 24-hour period. Shows under compensation, too small capacity regulator, large drop from substation to load center and too high no-load spring setting of contact-making voltmeter. An unusual condition, but shows what may happen undetected if a comprehensive check is not regularly made.

The transformer low side terminal voltage labeled No. 4 in Fig. 4 shows a bad drop when the evening peak comes on in spite of the fact that this transformer is one of the nearest to the substation on that phase. It might be due either to the compensator resistance setting being too low or the regulator too small in range. Other ways of looking at it might be to say that the primary is too long or small or the bus voltage is too low. In this case it was found that although both the resistance and reactance of the line-drop compensator was set at the maximum value the regulator did not boost the feeder voltage enough at peak load. This is due to the fact that peak load on the feeder was just two-thirds of the regulator current rating, too great, however, to permit operation of the regulator coils in series, so that to cure this condition it would be necessary to extend the range of the line-drop compensator settings or decrease the current transformer ratio. Even if either of these two corrections were made the regulator used would still be inadequate in range. For the best result the voltage at No. 4 during peak load should be several volts (3-5) above nominal. Using 3 volts the regulator would have to boost bus voltage a total of 18 volts or 18/120, equal to 15 per cent. The regulator on the connection required by the load (coils in parallel) can boost only 10 per cent and is thus 5 per cent low in range.

It also appears that the nominal voltage setting of the contact making-voltmeter is too high, since the voltage shown by the graphs marked Nos. 4 and 5 during the light-load periods averages several volts above nominal. Lowering these voltages at such times by lowering the voltmeter setting would materially narrow the range of variations.

2. Voltage drop in secondary circuits seems to be largely responsible for the variations recorded. Other causes were found which appear to be contributory. Some of these are transformer and primary drop and too small range or improperly set regulators.

3. Due to methods employed in checking feeder voltages regulators are not generally set to best advantage.

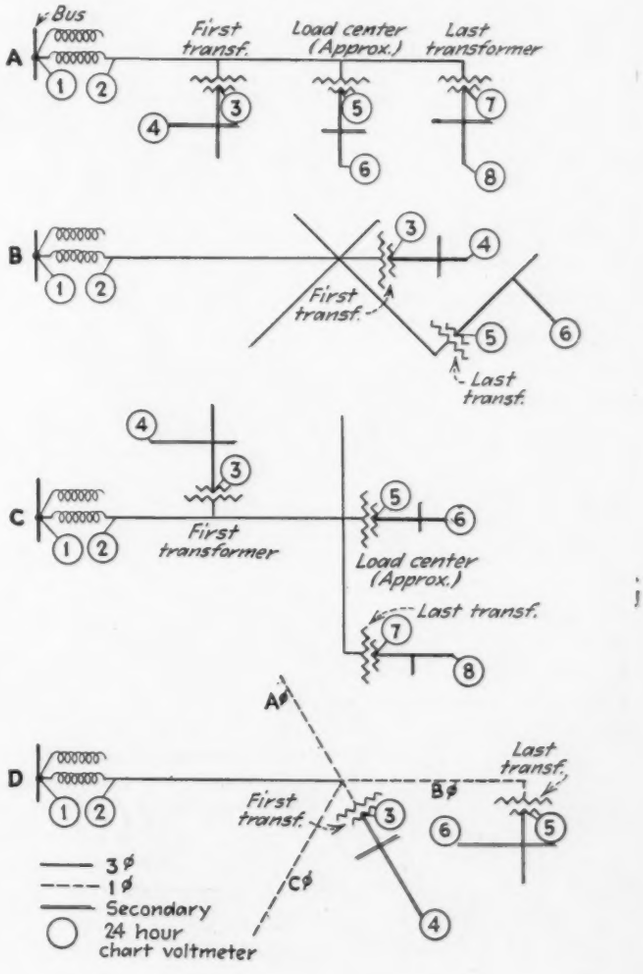
4. Sudden changes in feeder voltage either up or down produce corresponding changes in current and power. Such changes are much greater at peak load than at light load for the same change in voltage. Over weekly periods feeder voltage seems to affect power supplied in much the same way, but results are not conclusive. Many variable factors enter to affect results of test, particularly weather.

These results bring up further questions, some of which might be touched on here. For example, how important is good voltage regulation to all customers, do operating companies know accurately what voltage variations exist on their feeders, how do they find out what better means of checking feeder voltages is offered, how close should voltage be maintained to nominal, etc.? These and many others present themselves, but most are not within the scope of this article. In the following paragraphs a few suggestions are made which it is hoped will be of some value to those interested in these problems.

The general acceptance and widespread use of induction feeder voltage regulators on lighting feeders is an indication of the importance attached to the problem of limiting the range of variations in the voltage delivered to customers. Other considerations bear this out. The advantages both to user and electric service companies applying the proper voltage to incandescent lamps has been clearly brought out in technical publications by many forms of charts and graphs which show the

Fig. 5—Suggested locations for recording voltmeters

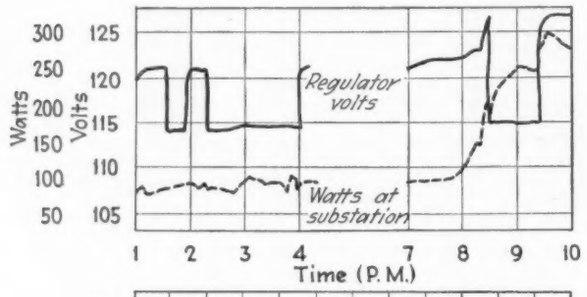
Four feeder arrangements in common use with suggested locations of recording voltmeters for obtaining a regular check on voltage. One such study a year on each feeder consisting of charts for several consecutive days would generally be sufficient. All meters shown might not be required in every case. The purpose of the study would determine the number of meters. A study to determine general feeder voltage conditions would usually require all meters shown. As a general principle it is easier to pick out the points of highest and lowest voltage than to estimate the location of the load center.



effect of voltage on candlepower, quality of light, power consumed, lamp life, etc. These advantages are further emphasized by the fact that incandescent lamps form the most important single item of load on distribution feeders supplying residential areas in point of number of users, power consumed and value of good will of users. Also the steadily increasing use of heating appliances is likely to bring the question of voltage more and more to the front. In this connection it should be remembered that revision of house wiring has not kept pace with the addition of appliance load, with the result

Fig. 6—Effect of sudden changes in feeder voltage on power supplied

Changes during light-load periods (1-4 p.m.) does not produce much change in watts at substation. Voltage changes during peak-load period produce very appreciable change in watts.



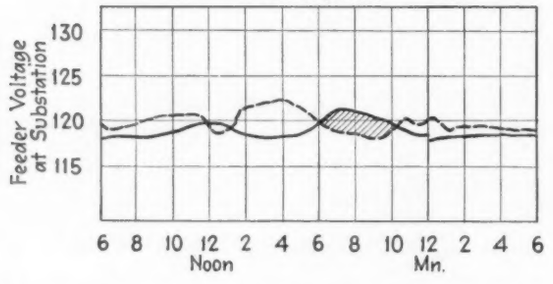


Fig. 7—Substation feeder voltages on B phase of feeder D

Every day of one week voltage was about as shown by full line due to action of regulator. The total kilowatt-hours for the week was 11,600. Next week voltage was as shown by dashed line due to the fact the regulator was on neutral. The total kilowatt-hours for this week was 11,090. These two weeks had exactly the same number of clear and cloudy days. The difference between these two is attributed to the voltage difference during the evening load period (shaded area).

that house wiring is generally inadequate, especially in the older installations.

On all the feeders studied the operating company felt that voltage conditions were good, that voltage variations were well within the limits demanded by good service. It will be generally admitted that most all the voltage variations shown in the graph are beyond the lower limit considered good service. A better means of detecting such conditions is, therefore, indicated.

The suggested procedure would be to make a study on each phase of every feeder about once a year, or more frequently on fast-growing feeders. Charts should be taken at locations shown in Fig. 5 several consecutive days and filed for reference. If the meters are weatherproof and adapted to pole mounting, the labor would consist of connecting two wires to the secondary at the top of the pole and mounting the meter. Meters for locations 4, 6, and 8 should be at the service switch on the customer's premises near or at the end of a secondary circuit. A few simultaneous charts at 2, 3, 5 and 7 (distribution transformer secondary terminals) should give a good indication of primary voltage conditions. In all cases a check should be made of the number of consumers connected to the secondary circuit or a "thermotel" installed to determine the approximate transformer loading.

One man with ten or twelve circular chart-recording voltmeters could probably obtain the suggested records for an operating company serving a city of 100,000. From a file of such records regulators could be accurately adjusted to give best service to the most customers, primary and secondary conditions known and revisions made as required, and, in general, a good record of feeder voltage conditions built up to be used for whatever purpose desired. For the purpose of setting regulators the charts of voltage so obtained might be used conveniently without establishing communication between substation and points out on the feeder. The procedure would be to set the compensators first by calculation and modify them after every set of charts, the reactance settings according to voltage during the light load periods and resistance by voltage during peak load. Two or three days' charts would usually suffice.

▼

Variety of Temporary Services from Transformer Trailer

By LLOYD C. GARRISON
New York Power & Light Corporation

A portable transformer bank mounted on a trailer, capable of receiving energy at three voltages and of delivering two single-phase and two three-phase voltages, has recently been placed in service by the New York Power & Light Corporation, a Niagara Hudson subsidiary, at Albany, N. Y. The trailer has been compactly built and is easily transported to the needed locations.

Three transformers, of 37½-kva. capacity, have been built into the trailer and a system of taps permit connections to be made quickly and easily to care for the various voltage transformations. The hook-up permits receiving energy at 2,400, 4,000 or 4,800 volts and of delivering 120 or 120/240 volts, single phase, or 240 or 480 volts, three phase. The capacity of the complete unit is limited to 70 kva. at 120 volts, single phase; 100 kva. at 120/240 volts, single phase, and 112½ kva. at 240 or 480 volts, three phase.

Fundamentally, the use of the trailer is to aid in maintaining an uninterrupted flow of service to customers, or at least to re-establish service with a minimum of delay. The transformer trailer, with its various voltage changes, is capable of replacing about 95 per cent of the distribution transformer installations in the area it serves. Any transformer failure in the Albany area will be of short duration, for the trailer can be brought into play to substitute for the transformer bank which failed. The exception to this, of course, will be in cases of small transformers which can be changed quickly.

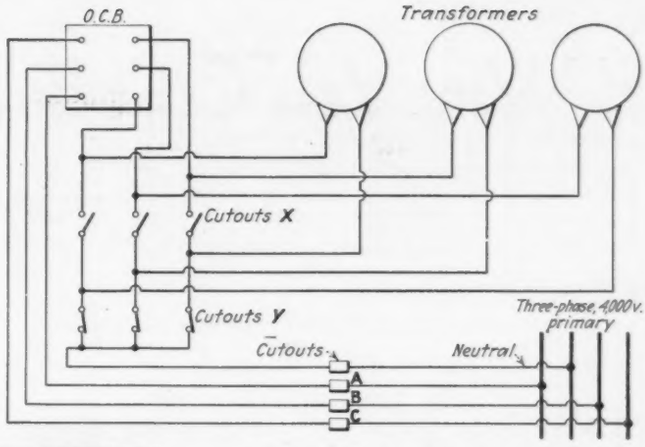
During transformer changes, the entire bank being

worked on can be "killed," permitting work to proceed in absolute safety while service to customers continues through the transformers on the trailer. The flexibility of the New York Power & Light trailer makes its use possible on almost any transformer change in Albany.

Temporary installations, such as carnivals, circuses, etc., will furnish a field of great use for the new trailer. The distribution voltage in the area where the temporary installation becomes necessary will make but little difference, for the trailer is capable of receiving any of the three in use and of delivering any that may be required.

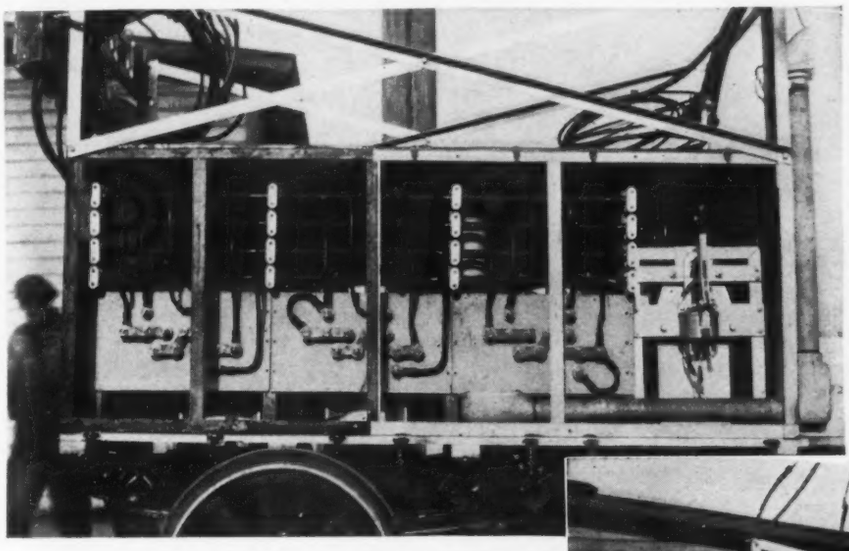
Another use for the trailer will be to thaw frozen underground water pipes. To accomplish this, the 4,800/120-volt hook-up is used on a 2,400-volt, single-phase circuit. With this arrangement 500 amp. can be delivered at 60 volts.

While the trailer can be substituted for any one of approximately 95 per cent of the distribution transformer banks in the Albany area, the remaining 5 per cent would require a trailer of unwieldy proportions. Included in that 5 per cent are the large industrial installations. To build a trailer with a capacity that would be applicable to 100 per cent of the transformer banks in the area would be uneconomical. The New York Power & Light unit, therefore, is thought to be one of the most economical, yet one of the most flexible, transformer trailers in use.



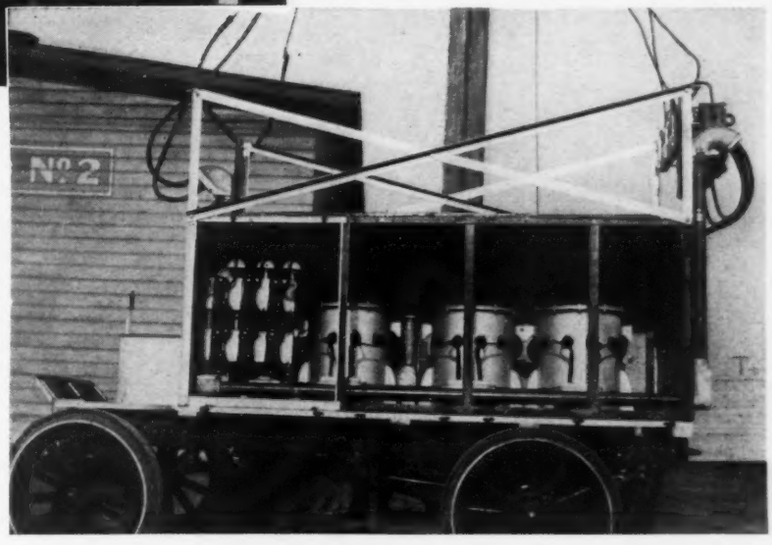
Switching facilities for energizing under different primary service conditions

The illustration shows connections for three-phase, four-wire, 4,000-volt primary service, 112½ kva. capacity. For single-phase, 2,400-volt service, 100-kva. capacity the switches remain the same, but conductors A, B, C are joined and connected to one side of supply circuit and wire labeled neutral to other side. For three-phase, 2,400-volt, 112½-kva. capacity cut-outs X are closed and Y open and wire labeled neutral left open. For 4,800-volt service the primary coils of the transformers are connected in series.



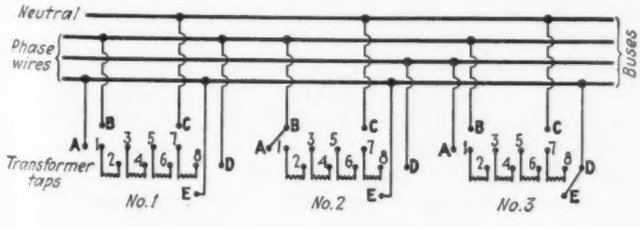
Primary and secondary circuit-changing facilities on portable transformer

On primary side cut-outs are used for changing connections, while similar length copper bars permit different connections of transformer taps. Observe permanent connection of busbars to secondary terminal board, oil circuit in secondary leads at right, and potheads at each end of truck with jumpers for attachment to primary and secondary circuits. Panels cover the sides of the tractor when units are energized. The secondary connections above are for 240-volt, three-phase delta service.



Simple connections of transformer secondary taps provide different service voltages

For single-phase, 120/240-volt service (100 kva.) join B-1-3; 2-4-5-7-C; 6-8-E. For 120-volt service (70 kva.) join B-1-3-5-7; 2-4-6-8-E. For three-phase, 480-volt delta service (112.5 kva.) join A-1; 2-3; 4-5; 6-7; 8-D. For 240 volt delta service (112.5 kva.) join A-1-3; 2-4-5-7; 6-8-D. Join 7-C on one transformer only for neutral tap.



Why You Can't Buy Oil on Specifications Alone

By K. A. NEWMAN
Research Staff, E. F. Houghton & Company, Philadelphia

THE present tendency toward purchasing all materials on specifications is undoubtedly a step toward wiser and more scientific purchasing. However, specifications, like any other movement, are not a cure-all and should be applied with intelligence.

A set of specifications can never take the place of business integrity and, unfortunately, specifications have frequently served as a cloak for the unscrupulous supplier. This is frequently true in the purchase of lubricating oils.

No set of specifications, however inclusive, has ever been able to guarantee the quality of lubricating oils. This is due to the fact that that intangible quality "oiliness" or "lubricating ability" cannot be covered in a set of specifications. Of course, if the supplier could specify the exact nature of crude from which the oil was to be refined and all of the details of refining, as well as the final specifications of the oil, he might be more nearly sure of the quality of the oil bought on specifications. But then how could he tell whether all of his specifications regarding the source and manufacturing process had been adhered to?

Integrity of seller most important

Hence if a set of specifications cannot guarantee the quality of the product purchased it seems wiser to buy on the integrity of the supplier for supplying the best product for a given purpose at an economical price.

Oil specifications refer to the physical specifications of an oil and not to its lubricating ability. A set of specifications is usually created by analyzing some oil which has been successful on the job.

The physical properties of oil usually referred to are: (1) Viscosity, (2) flash point, (3) fire point, (4) cold test or pour test. While these factors look fine on a laboratory report, they do not indicate the lubricating value of oil, nor do they insure the satisfactory performance of the oil.

Viscosity—The viscosity of an oil merely measures its resistance to flow through a certain size orifice. The temperature of the oil has a great influence on its viscosity, and, therefore, for purpose of comparison viscosity readings are usually taken at a temperature of 100 deg. F. (38 deg. C.). However, the size of orifice in the bearing being lubricated and the temperature of the bearing seldom agree with the size of orifice and the temperature at which the viscosity was taken. Two oils having the same viscosity in a laboratory test taken at 100 deg. F. (38 deg. C.) may not have anywhere near identical viscosities at the somewhat higher temperatures under which they may have to operate.

Oils of the same viscosity can be made from either asphalt base crude or Pennsylvania crude, and yet their lubricating values will differ greatly. Therefore, viscosity readings do not mean much except to the experienced lubrication engineer, and to the oil refiner as a check on the uniformity of his product.

Viscosity is useful as an indicator of internal friction, as a thick oil will have greater internal friction than a thin oil. But here again it means nothing unless taken at the temperature at which the oil is to be used. Any one can see the folly of buying an oil whose viscosity is a certain amount at 100 deg. F. (38 deg. C.) when the oil is to be used at a somewhat higher or lower temperature.

The viscosity curves of different oils will be found to vary greatly. By that we mean that two oils of the same viscosity at 100 deg. F. (38 deg. C.) may not be anywhere near the same at 150 or 175 deg. F. (65 or 79 deg. C.). The viscosity curve of an oil sometimes remains fairly flat through a temperature rise of 10 or even 25 deg., and then may fall away very rapidly.

Flash Test—The flash test of an oil indicates the temperature to which an oil must be heated at a specified rate so as to free enough vapor to flash, or momentarily ignite, when it is subjected to an open flame. In testing oil for its flash test, the oil is gradually heated, and at each few degrees rise of temperature a small flame is applied to the surface of the oil for a few seconds. As soon as the oil flashes, this temperature is taken as its flash point.

Fire Test—The fire test of an oil is the temperature, usually 25 to 75 deg. F. (14 to 42 deg. C.) above the flash point, at which the oil gives off sufficient vapor to burn steadily if subjected to an open flame.

Weaknesses of tests

Flash and fire tests are usually given a great deal of prominence when oil is to be subjected to service at high temperatures. Flash and fire tests, however, are taken at atmospheric pressure and an open flame is brought into contact with the oil. In air compressor lubrication, for example, it is customary to specify an oil of high flash point, but the oil functions under high pressure, which automatically raises its flash point, and it never comes into contact with an open flame. In this and many other applications the flash and fire tests made in the laboratory usually mean little so far as the suitability of the oil for a given service is concerned.

Cold Test—The cold test of an oil, which is given a great deal of prominence, is only useful where the oil is liable to be subjected to low temperatures in operation, which would tend to congeal an oil if it did not have a sufficiently low cold test. The cold test is sometimes called the pour test and simply indicates the lowest temperature at which the oil will flow. Specifications

for refrigerating machine oils sometimes call for a Pennsylvania crude with a cold test of as low as —5 deg. F. (—20 deg. C.). The lowest cold test obtainable with pure Pennsylvania crude is about 25 deg. F. (—3.9 deg. C.). The only way to lower this is by dewaxing, which makes a very expensive oil. So the man who says he is selling you a regular-priced oil made from pure Pennsylvania crude with a cold test much below 25 deg. F. (—3.9 deg. C.) does not know much about oils.

Horse trading and oil buying

Years ago horse trading used to be quite a common business. The physical specifications of a horse were its age and its weight. You could tell its age by looking at its teeth and get its weight by putting it on the scales. But the wise horse trader never bought a horse purely on "specifications." He would insist upon a "work test," because he was more interested in what the horse would do than in its physical specifications. If he were buying a trotting horse, he wanted to find out how fast the horse would go and how long he would keep it up. If he were buying a work horse, he would want to know how much the horse would pull, how fast he could pull it and how long he would keep on working.

Buying oil today is almost as hazardous as horse trading in the old days. Mistakes are mighty expensive and are very easily made. A man who is gullible enough to buy oil on physical specifications is almost sure to have a lot of "lame" oil put over on him.

J. R. Battle, in his well-known handbook, "Industrial Oil Engineering," says:

> It is unfortunate that lubricating oils lend themselves so readily to a number of scientific tests, because, due to this fact, these tests have become the common property, to a very considerable extent, of operating engineers, oil salesmen, purchasing agents and others who are not equipped with sufficient knowledge of the refinement of oil to appreciate what the tests really signify.

You buy an oil to lubricate under certain definite conditions rather than to meet certain physical specifications. There is no job of lubrication which has one oil of certain prescribed tests as its only solution. Those who try to sell oil on specifications rather than on performance are usually trying to throw a smoke screen to cover up the poor quality of their oil.

The only satisfactory "specification" for buying lubricants is to buy from a manufacturer who knows through research which is the best lubricant for each type of service, and who refuses to sell anything but that best.

▼

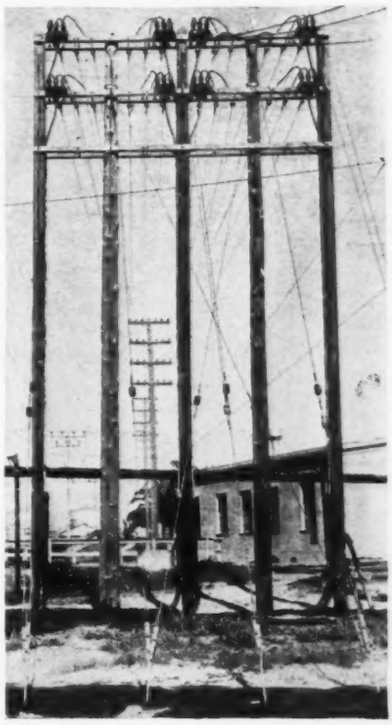
Unusual Chain of Events Results in Service Interruption

The extent to which adverse circumstances can accumulate to precipitate service interruptions is emphasized by a recently released report of the Connecticut Public Utilities Commission on the causes of the outage of United Illuminating Company service in New Haven on March 22 (see ELECTRICAL WORLD, April 2, 1932, page 597). The initiating cause found by the commission's engineer was the failure of a 13.8-kva. cable pothead which was close enough to its transformer to melt the oil-cooling tubes when the sustained arc failed to clear. The oil fire incapacitated several other transformers. Substation and station relays functioned to clear the fault, but a defective toggle prevented the feeder breaker at English station from opening.

Meanwhile ground fault relays at the station had shunted out the 3-ohm neutral reactor after a delay. This enhanced the fault current still further. Also the main station bus was undergoing alterations, so all machines were operating on the unsectionalized reserve bus. Consequently the fault could be cleared only by tripping all generators off the bus. The fault persisted for about ten minutes. The commission's engineer recommended that station operation be so arranged as to make the available bus sectionalizing oil switches effective on the reserve bus whenever all portions of the main bus are out of service.

▼

Multi-Circuit Riser Structure Designed for Safety



In bringing eight underground distribution circuits from the substation of the Associated Oil Company's Avon (California) refinery to a distribution line extending across the property the engineers designed the unusual structure shown in the accompanying illustration. As four future circuits were contemplated, the riser structure was designed to support twelve circuits. Two 60-ft. poles and three 12x12 timbers of the same length were set on approximately 5-ft. centers so that a pole was between each of the outside and center timbers. Double crossarms were bolted across the top of the structure, for mounting the potheads and attaching take-offs for each of the twelve three-phase lines, eight of which are now installed.

Lead-covered cables are carried up the square timbers, no live circuit being carried on the poles themselves. When linemen are working on the structure they work from the poles, which are so situated as to provide easy access to any of the circuits on the structure. This design promotes safety and provides an inexpensive take-off structure for a large number of circuits.

Certified electric home including range, refrigerator, bathroom heater and oil burner. The wiring price was $275, against $80 for a similar house on the non-certified plan. Note certification by utility company on second signboard from the left.

Adequate Wiring Stimulated by Utility Certification

Adequate, not minimum wiring stressed.
Every home an individual case.
Investing for broader service satisfies builder, owner and electrical interests.

TO OVERCOME the handicap imposed by the fact that nearly all new houses, and particularly those erected by speculative builders, are inadequately wired the Western Massachusetts Companies has established a plan for certifying house wiring installations and electrically equipped homes on the basis of an engineering report prepared for each individual house which recommends a specific layout in every case for the indorsement of the subsidiary operating company and the approval of the builder or owner. The company's certification carries so much weight with builders and prospective home buyers that the sale of these well-wired homes has been speeded and increased prices willingly paid for them as compared with uncertified houses of about the same grade. The number of outlets is increased over usual practice and in general exceeds Red Seal standards; the electrical manufacturer's market is enlarged, the contractor-dealer, retailer and central station do more business, and the home occupant enjoys a far more complete service than under the older plan of leaving the adequacy of the wiring installation to architect or builder, with all the evils of cutting down layouts under contractor competition.

Informal suggested wiring layouts by the subsidiary company at Greenfield, Mass., had been utilized for about three years prior to the adoption of the formal certification plan. As a result the average price of house wiring increased from $75 to $200 for seven- and eight-room homes and the average number of outlets per house increased from 45 to 90, including a range outlet. The certified plan was launched in the late summer of 1931, but was not given extended publicity until 1932, as the company desired to have several certified jobs in each territory to show customers inquiring as a result of the advertising.

The Western Massachusetts group believed that inadequate wiring acts as a deterrent to the use of appliances, in some cases being a source of danger through the use of long extension cords. At the time the plan was devised there were several wiring promotional plans in effect, but these had the following disadvantages: (1) A contractors' organization was presupposed; (2) a fixed standard of wiring was set up which could be applied on a rule-of-thumb basis by the contractor or any one else; (3) these fixed standards purported to be a minimum rather than an adequate standard, and further failed to consider the variations of plans and individual needs; (4) published fixed standards would require frequent revisions to keep them up to date.

In devising a plan which would preserve the good qualities of the others it was felt that several basic objectives were to be attained:

1. Each house should be considered as if it were the

Four-family apartment home with certified wiring and equipment

The wiring price was $425, compared with $135 on the non-certified basis with incomplete facilities for electrical service. Utility certification is on signboard at right.

only one ever built and the wiring layout should be made to fit a specific floor plan.

2. This layout should be made by the company's own wiring specialists and should provide adequate, not minimum wiring.

3. There should be no rigid, published standards. In this way improvements in the art of additional needs could be worked in as the occasion arose.

Details of the plan

The purpose of the certified wiring plan is to insure the installation of proper and adequate wiring in both new and remodeled homes. An extension of the plan, known as the "Certified Electric Home Plan," includes the permanent installation of an electric range and refrigerator.

The services of the lighting service department of the utilities are offered to any one interested in residence construction for the preparation of wiring layouts and the writing of electrical specifications. No standard requirements have been drawn up for the location of outlets and switches, for it is felt that layouts should be individual for each separate project. These layouts are made on the architects' plans or on separate plans prepared by the lighting service department. The specifications include a contract form for the convenience of architect or builder.

Certified modern wiring requirements

Nine major points are set forth in the company's requirements for certification: (1) National Electrical Code installation, with adherence to municipal and state ordinances and approval by authorized inspector before connection to the distribution system; (2) outlet locations as shown on company layout; (3) convenience outlets on separate circuit from ceiling outlets in each room; (4) range circuit leading to a heavy-duty plug or outlet in kitchen, minimum size wire No. 6; (5) electric refrigerator outlet; (6) laundry wired for heavy appliances; (7) built-in bathroom heater; (8) garage wired for lighting and appliances; (9) all work done by a reliable contractor.

For the certified electric home all wiring and equipment must follow the above specifications, plus a fully automatic electric range and an electric refrigerator, as stated.

Upon compliance with the requirements by the builder and contractor, the wiring specialist of the local power company inspects the installation and awards a certifi-

"Is the wiring modern?"
IF IT'S CERTIFIED THE ANSWER IS . . "Yes!"
CERTIFIED MODERN WIRING
◆Of course you want your new home to possess the modern aids to housekeeping. You'll want to cook electrically . . . you'll want electric refrigeration . . . you'll want conveniently located switches for your lights . . . and you'll want plenty of well located outlets for your portable lamps and small appliances.
◆Perhaps you will not use all the electrical aids to home-making when you first move in—but you know you will be using them soon and you naturally want to feel assured that the facilities are there, ready for use!
◆In the home equipped with Certified Modern Wiring, the electrical wiring has been planned to enable you to make the greatest possible use of your electrical appliances in the most convenient manner.
Insist on Certified Modern Wiring before you buy—look for the sign on the lawn and the certificate on the mantelboard.

Before you buy
CONSIDER THE WIRING
THE electrical wiring is only a detail in the construction of a house . . . but it's a detail that will have a tremendous bearing on the comfort and convenience enjoyed by those who make the house their home.
◆
When you're planning to buy a home—look over the wiring! Does it provide for the full use of labor-saving electrical appliances . . . is it wired for an electric range . . . or an electric refrigerator . . . are the lighting switches conveniently located?
◆
If the Certified Modern Wiring certificate is on the mantelboard, your questions are answered. The Certified Modern Wiring seal means that the electrical wiring has been planned according to modern standards — to provide convenience in using electrical aids to homemaking.
WESTERN MASSACHUSETTS CERTIFIED MODERN WIRING COMPANIES
Look for this seal when you go house-hunting—it assures adequate wiring.

Typical newspaper advertisements featuring certified installations

cate, which is permanently attached to the meter board. The company provides a sign for use on the lawn until the house is sold. This carries the company seal and the names of the local company, the builder, architect and electrical contractor.

Advantages of the certification plan

The great problem of all speculative builders is to sell as quickly as possible their completed residences. C. P. Golding, sales manager of the Western Massachusetts Companies, states that the company firmly believes that the certification of wiring and appliances in homes helps to do this. One of the latest certified electric homes in Greenfield was fitted up with furniture and opened to public inspection February 22. More than 2,500 persons visited the house during the week and papers were passed closing the sale February 27. Ground was broken by the same builder for his next house February 29. The public today demands more than ever all the latest comforts and conveniences in homes. Layouts providing for each building project do away with the usual guesswork in planning the wiring system and eliminate the possibilities of "extras."

The services of the lighting service department are available at all times to architects. Co-operation in the design of special lighting fixtures and the solution of individual problems is sought by the company in order to secure correct architectural design and at the same time provide proper and adequate illumination. Residence wiring layouts are made conforming to the ideas of architects as well as to the company's requirements.

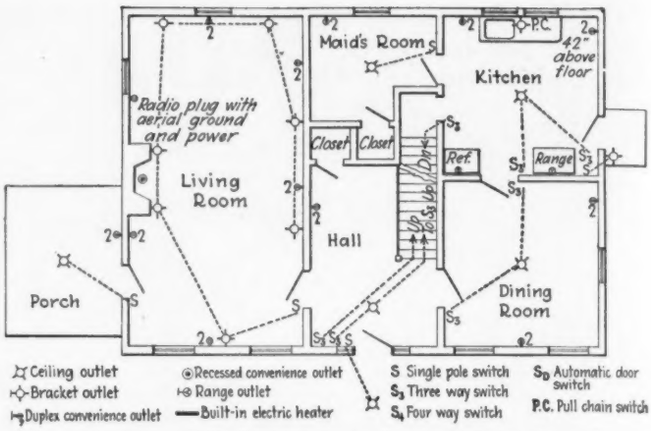
The electrical contractors receive definite specifications on which to base their estimates. Not only are the number and kind of outlets given but also the definite locations, so far as can be determined from structural requirements. The elimination of "extras" avoids disputes and needless labor and cutting.

19—DINING ROOM:
One (1) ceiling outlet, controlled by two 3-way switches as shown, outlet rated at 100 watts.
Two (2) baseboard plugs as shown, rated at 200 watts per outlet.
20—KITCHEN:
One (1) ceiling outlet controlled by two 3-way switches as shown, outlet rated at 100 watts.
One (1) bracket outlet over sink as shown, pull chain control, outlet rated at 50 watts.
One (1) baseboard plug near cellar stairs, rated at 200 watts per outlet.
Two (2) wall plugs near sink as shown, rated at 500 watts per outlet.
Range plug—Three (3) No. 6 B & S gauge insulated copper wires to be run from power cutouts on meter board to range plug in kitchen. Use G.E. Plate No. 6x548, G.E. Receptacle No. 6x542 and G.E. Plug No. 6x540, or its equivalent.
21—MAID'S ROOM:
One (1) ceiling outlet controlled by S.P. switch as shown, outlet rated at 75 watts.
One (1) baseboard plug as shown, rated at 200 watts per outlet.
22—STOOP:
One (1) bracket outlet controlled by S.P. switch in kitchen as shown, outlet rated at 50 watts.

Second Floor

23—HALL:
One (1) ceiling outlet controlled by two three-way switches and one four-way switch as shown, outlet rated at 75 watts.
One (1) baseboard plug as shown, rated at 100 watts per outlet.
24—LARGE BEDROOM:
Five (5) bracket outlets controlled by S.P. switch as shown, outlets rated at 50 watts each.
Three (3) baseboard plugs as shown, rated at 100 watts per outlet.
One (1) floor plug to be set in mantel shelf over fireplace. Plate to be flush with mantel, outlet rated at 100 watts.
Two (2) ceiling outlets, one in each closet controlled by door switches as shown, outlet rated at 50 watts each.

Page from typical electrical home specification



Typical plan of first floor for an electrical home of the certified class

All outlets and switches are located for the individual house and not according to a standard schedule.

Of all the parties interested in the operation of this plan the home owner benefits most. A certified modern wiring system or electric home is his guarantee that he may enjoy all the advantages to be derived from the full use of electricity. Not only is the home wired according to the best modern methods, but provision is made, so far as it is economically possible, for future developments in the field of home appliances. Piecemeal adding of outlets is avoided from the start.

Certified wiring helps sell homes

Builders who have used certified modern wiring find that they are able to recover more than the cost of the wiring because they are able to obtain a higher price for the house on the strength of the wiring job. In addition, it gives them another talking point, to show the advantages of their houses over the general run.

From the central station standpoint certified wiring encourages the greater use of electricity in the home by providing adequate facilities. It increases the electrical consciousness of customers by getting them to look into and demand modern wiring. It equips each new house with complete wiring for an electric range, refrigerator and laundry equipment.

The work of both certified wiring and certified electric homes is handled as an activity of the lighting service department, whose primary duty is with commercial lighting customers. Therefore no available figures are as yet at hand regarding the cost of this work, but it has not grown to such proportions that special employees are required.

About twenty of the homes had been certified formally at the close of the winter, but as the knowledge of the plan spreads in the different territories and as the advertising and certification displays become better known it is expected that there will be a rapid increase in the work. The plan has not been in effect long enough yet for the company to obtain comparative figures on the energy use of homes having certified wiring and those not so provided in similar size and location, but the Western Massachusetts Companies are quite firmly convinced that the plan will more than pay for itself as time passes.

Electric Cooking Aided by Black-Bottom Utensils

By A. S. LOIZEAUX
Electrical Engineer
Consolidated Gas, Electric Light & Power Company of Baltimore

Coating the bottoms of aluminum utensils with suitable black lacquer definitely increases their thermal efficiency about 10 per cent and reduces the time required to bring water to the boiling point with electric heating, according to tests made by the Consolidated Gas, Electric Light & Power Company of Baltimore. The effect of the black bottom is greater on the open coil radiant type heater than it is on the totally inclosed coil or hot plate type. In a thirty-minute test with a 6-in. pan with three pints of water the efficiency was increased from 59.8 per cent to 71.5 per cent by coating the bottom of the pan with a film of black lacquer. In a one-hour test with an 8-in. kettle with five quarts of water the efficiency was increased from 74.3 per cent to 80.6 per cent by black lacquering the bottom. To the domestic user the most noticeable effect of the black bottom on the aluminum utensils is the difference in the actual time required to bring a given quantity of water to the boiling point. For instance, with a bright bottom 8-in. aluminum kettle containing five quarts of water 38 minutes was required from the time the current was turned on the cold 1-kw. open coil heater until the water reached the boiling point. Under similar conditions, with the bottom of the kettle black lacquered, 32 minutes was required to bring the same quantity of water to the boiling point.

Cooking utensils are now sold commercially with black lacquered bottoms for the purpose of increasing their efficiency with electric cooking. Pan No. 2 listed on the data sheet was purchased with a black bottom. The other tests were made with black lacquers applied by us. Among the lacquers which we tried, "Chi-Namel" black opaque lacquer, LX 803, Z 978, manufactured by the Ohio Varnish Company, Cleveland, Ohio, has withstood heat and washing best. A pan coated with this lacquer was heated for twelve hours and soaked over night in strong washing powder water with practically no effect on the lacquered surface.

Tests to Determine Relative Heat Absorption

	Per Cent of Input to Heater Absorbed by Kettle and Water	
Test No. 1 — Three Pints Water Heated from 73 Deg. to 180 Deg. F. Six-Inch, Two-Quart Pan	1 Kw. Hotpoint 6-In. Open Coil Heater, Per Cent	1 Kw. Corox 6¼-In. Closed Heater, Per Cent
Bright bottom aluminum pan No. 1	57.3	83.6
Pan No. 1, bottom black lacquered	74.3	87.5
Black bottom aluminum pan No. 2	72.00	89.5
Dark gray granite pan No. 3	76.00	87.0
Test No. 2 — Three Pints Water Heated 30 Minutes. Six-Inch, Two-Quart Pan		
Bright bottom aluminum pan No. 1	59.8	73.3
Pan No. 1, bottom black lacquered	71.5	79.0
Black bottom aluminum pan No. 2	69.5	82.8
Dark gray granite pan No. 3	67.3	73.0
Test No. 3 — Five Quarts Water Heated from 73 Deg. to 180 Deg. F; Eight-Inch, Eight-Quart Kettle		
Bright bottom aluminum kettle No. 4	79.1	....
Kettle No. 4, bottom black lacquered	91.5	....
Test No. 4 — Five Quarts Water Heated One Hour. Eight-Inch, Eight-Quart Kettle		
Bright bottom aluminum kettle No. 4	74.3	....
Kettle No. 4, bottom black lacquered	80.6	....

▼

Contract for Central-Station Exhibit Closed

The Electrical Central Station Committee has just closed a contract with the Century of Progress Exposition, under which a comprehensive electrical exhibit showing the utilization of electricity in every walk of life will be made in Chicago in 1933. Electricity-consuming devices of all types, in surroundings similar to their usual environment in every-day use, will be demonstrated in this display.

New incandescent lighting methods and gaseous-tube adaptations will be shown. Various methods and types of wiring, the most modern electrically operated labor-saving devices, electrical cooking, room cooling and air conditioning, and in fact a complete display of electrical equipment for every department of the home will be exhibited.

Commercial displays will emphasize the importance of adequate illumination for every class of work, room cooling and air conditioning, motor-driven appliances for commercial use, electrical communication, the most modern retail store lighting equipment, application of electricity for cooking in restaurants, refrigeration, electric heating, humidification equipment, etc.

Outdoor electrification will be illustrated by a model of a typical city area, displaying floodlighting, sign, street and highway lighting, sports lighting, festival and airport lighting, etc.

A model factory lighting installation will demonstrate the increased production due to adequate lighting as compared with old methods. Applications of small heating units for industrial uses and the adaptation of modern scientific developments in industry, such as the photo-electric inspection operation, will be included.

Modern uses of electricity on the farm, in residences and outbuildings will open a vista for those who have not followed developments in this field. A general scientific exhibit of lighting will demonstrate the speed of vision, glare and other lighting and vision fundamentals. A schoolroom will be equipped for all purposes to which electricity can be adapted. Lamps and lighting showing the value of color, its adaptation and practical uses and all known types of standard lighting equipment will be included. Spectacular displays of scientific phenomena using electricity and its very latest developments will add an element of entertainment as well as education.

The Electrical Central Station Committee in charge of this program is headed by E. W. Lloyd (chairman), Commonwealth Edison Company, Chicago. Men connected with eight other utility companies are on the committee.

READERS' FORUM

Proposes Commission Supervision of Municipal Systems

To the Editor of the ELECTRICAL WORLD:

There are many states in which a considerable part of the light and power service is furnished by the municipality. In Missouri 28 per cent of the towns over 2,500 population are served by city-owned systems. In Kansas the percentage is 38 per cent. According to the law of chance, part of these municipal systems will furnish very good service. By the same law, the service from an equivalent number will be very poor. The sad part of it is that the light and power users who receive poor service cannot turn to the state public service commission for protection, because the commission has no authority over publicly owned enterprises.

In justice to the municipalities, it must be said that any unfairness or inefficiency that exists is not intentional. Some of the municipal systems are so small and so isolated that they cannot afford the specialized staff that is necessary for the very best operation. If any one is disposed to doubt this, let him check the city-owned plants of his acquaintance against the following brief list of proved operating policies and see how many shortcomings he can discover:

Technical—(a) Routine testing of customers' meters; (b) uniform and iron-clad standards for distribution system construction; (c) periodic voltage tests on customers' premises; (d) competent growth-of-load studies to provide for efficient distribution and for system expansion.

Purchasing—(a) Use of specifications and contracts; (b) interchange of surplus and used materials with neighboring systems; (c) taking of extra discounts on meters, transformers, etc., by group purchasing.

Commercial—(a) Energetic dealer-co-operation policy; (b) tie-in with national campaigns to sell irons, kitchen lighting units, refrigerators, etc.; (c) aggressive fight to sell power to large and off-peak users at competitive rates; (d) effort to extend the benefits of electricity to neighboring villages and outlying farms.

Legal—Advisory staff of lawyers skilled in public utility problems.

Accounting—Up-to-date accounting routine as recommended by the N.E.L.A. or the state public service commissions.

Executive—(a) Effective public relations policy; (b) modern safety and employee-welfare work; (c) hard-working and efficient staff free from family and political deadheads.

Financial—(a) Finance policy designed to get the best out of the changing money markets and to squelch any ideas of city councilmen who can't see past the figures in the bank book; (b) rate studies to establish a fair schedule that will just cover operating expenses, interest and retirement charges.

Even if the cities cannot afford complete staffs of operating specialists, they can afford to contribute a management fee to some centralized authority that could supply such service when needed. Why couldn't the state public service commissions organize, supervise and direct the municipally owned utilities of their respective states, thereby guaranteeing A-1 system operation and a square deal to all customers? With such an arrangement it is likely that commissions' instructions to and criticisms of privately owned utilities would command more respect because it would then be known that the commissions were not theorizing but speaking from a first-hand knowledge of what it takes to operate an electricity system successfully.

1501 Anthony Street,
Columbia, Mo.

STANLEY GILMORE.

▼

BOOK REVIEWS

Baschet I Konstruirovanie Elektricheskikh Mashin Peremennigo Toka

(Electrical and Mechanical Design of Alternating-Current Machines)

By A. LaBerger and V. A. Panteleev. State Scientifico-Technical Publishing House, Moscow, U.S.S.R. Price, $3.10.

An outstanding feature of this book is the presentation in one volume of both the electrical and mechanical design of the general types of synchronous and asynchronous machines. The authors, engineers with the Kharkov electric manufacturing plant, the largest in Soviet Russia, give in this treatise the methods of design as used not only in their plant but also those used in western Europe, particularly in Germany. It is presupposed that the reader has a good knowledge of the theory of electric machines, the authors limiting themselves to the presentation of the design procedure that would be followed by the design department of an electric manufacturing concern. Turbo-generators and special types of alternating-current machines are not considered in this volume. Poor paper and numerous typographical errors mar the value of the book that otherwise brings together a good deal of information now scattered through the various pages of the technical press.

▼

Lichtelektrische Zellen und ihre Anwendung

(Photo-electric Cells)

By Dr. H. Simon and Dr. R. Suhrmann. Julius Springer, Berlin W9, Linkstrasse 23-24. 373 pages, 295 illustrations. Price, paper, 33 reichsmarks; bound, 34.20 reichsmarks.

Recognizing the existence of other recently published books on photocells, the authors of the present volume have undertaken a more comprehensive treatment of the subject. It includes a discussion of the underlying theory of the photo-electric effect, with a quantitative expression for the relation between the incident luminous energy and the electron emission, and much detailed information on the construction of various types of cell. Such topics are taken up as the production of pure metallic-film deposits and the properties of glasses that affect the performance of the cells. The remaining two-thirds of the book are devoted to methods and apparatus used in measurements connected with researches in photo-electricity and to applications in science and in the arts.

Men of the Industry

H. H. Henline Acting National Secretary of A.I.E.E.

By unanimous action of the board of directors of the American Institute of Electrical Engineers at its regular meeting, held May 20, Henry Harrison Henline, since 1927 assistant national secretary, became acting national secretary of the Institute. In his new capacity Mr. Henline takes over the executive duties for twenty years performed by the late F. L. Hutchinson, who was national secretary of the Institute at the time of his sudden death last February.

For many years Mr. Henline has been interested in and actively associated with Institute work and prior to his affiliation with the national headquarters staff made numerous contributions to its published technical works. He was elected to membership in 1919.

A native of Colfax, Ill., and a graduate of the University of Illinois, Mr. Henline entered the Chicago Central Station Institute of the Commonwealth Edison Company and following graduation entered the employ of the Illinois Maintenance Company of Chicago. Joining the faculty of Stanford University in 1917 Mr. Henline gave at various times many courses in electrical engineering subjects, and was in charge of the machinery laboratory for five years and in charge of communication engineering for three years. He also was associated with Dr. Harris J. Ryan in some of the high-voltage research that has made Stanford famous. Mr. Henline is a member of the Society for the Promotion of Engineering Education and the Institute of Radio Engineers and a fellow of the American Association for the Advancement of Science.

•

CHARLES L. FORTESCUE, consulting transmission engineer of the Westinghouse Electric & Manufacturing Company, was made the recipient of the Cresson medal by the Franklin Institute of Philadelphia at the medal day exercises held May 18 for the development of method of symmetrical co-ordinates applied to the solution of polyphase networks.

•

THOMAS K. CUMMINS has been elected a vice-president of the Edison Electric Illuminating Company of Boston, succeeding Walter C. Baylies, who recently became president of that organization. Mr. Cummins was educated at Harvard University and has been a member of the Massachusetts bar since 1887. His early business connections were in the railway and banking fields at Boston, and since 1906 he has been a member of the board of directors and treasurer of the Edison company. He will continue as treasurer and member of the executive committee of the board.

▼

OBITUARY

H. H. Scott

Holton H. Scott, a past-president of the National Electric Light Association and for many years prominently identified with the Doherty utility interests, died suddenly, of a stroke, May 19 at his home in Pelham, N. Y. He was 57 years of age. A native of Orillia, Ont., and a graduate of the University of Wisconsin, Mr. Scott entered the utility field with the Madison (Wis.) Gas & Electric Company. Subsequent connections followed with public plants at San Antonio, Tex.; Lincoln, Neb., and again at Madison.

It was in 1906 that he removed to New York as chief engineer of Henry L. Doherty & Company, engaging in the examination of the properties taken over and owned by that company. Later he became general manager, remaining in that position until his retirement in 1922. He retained a connection with the company, however, until his death. Mr. Scott became president of the National Electric Light Association in 1913, after serving with conspicuous success for several years as chairman of the membership committee.

▼

WILLIAM W. HANDY, electrical engineer of Baltimore, Md., died May 18, at the age of 61, after an illness of several months. Mr. Handy was graduated from Haverford College in 1891 and two years later Johns Hopkins University granted him a certificate of proficiency in applied electricity. For many years Mr. Handy was president of William W. Handy & Company, Inc., consulting engineers, since dissolved. In recent years he had maintained his own practice.

•

LOUIS C. DATZ, chief engineer of the Public Service Company of St. Louis and formerly chief engineer for the Memphis Power & Light Company, died suddenly at St. Louis last week. Mr. Datz entered upon his public utility career with the New Orleans Railway & Light Company in 1903. In 1911 he became connected with Ford, Bacon & Davis as assistant engineer and a year later, when the American Cities Company was organized and the New Orleans company became a part of this group of Southern properties, he returned to the New Orleans properties as engineer of maintenance of way, engineer of roadway and then chief engineer of the system. Subsequently, when the United Gas & Electric Engineering Corporation established an office in the South, he assumed engineering supervision of public utility properties in New Orleans, Houston, Birmingham, Memphis, Knoxville and Little Rock. Resigning as vice-president of this corporation, he was named chief engineer of the American Cities Company. He served in this office until the spring of 1922. when the American Cities Company was taken over by the National Power & Light Company, and it was at this time that he transferred his interests to Memphis, Tenn. He had been in St. Louis since 1925. Mr. Datz was active in association work, having been president of the engineering section of the American Electric Railway Association.

•

HENRY E. LYLES, manager of the Housatonic division of the Connecticut Power Company for 27 years, died May 22 at the New Haven Hospital. Mr. Lyles was a resident of Canaan, Conn., for 35 years, although he was born in Brooklyn, N. Y., 64 years ago. He became one of the organizers of the Berkshire Power Company, one of the pioneer utility companies supplying power to communities in the Housatonic Valley, and when in 1918 the Connecticut Power Company acquired the Berkshire utility he retained the managership of the Housatonic division. His other industrial interests included the North Canaan Water Company, of which he was president and treasurer for a number of years; the Canaan Printing Company and the Canaan National Bank, with which institution he had been identified as a director since 1912.

New Equipment Available

Light-Duty, Self-Starting Synchronous Motor

A synchronous motor of the single-phase, self-starting type, designed to meet the most rigorous demands of the instrument and control apparatus applications for continuous service, is announced by the Bodine Electric Company, Chicago, Ill. While it starts as an induction motor, it operates as a synchronous motor. It is rated at 1/150 hp. at 1,800 r.p.m. on 110-volt, 60-cycle current, weighs 4 lb. and its diameter is $3\frac{21}{64}$ in. and the over-all length is $5\frac{7}{16}$ in. The motor has a pull-into-synchronous torque of 3.75 inch-ounces, which is the prony brake reading with no external inertia. The full-load input is approximately 30 watts.

▼

Signal Device for Determining Temperatures

A temperature signal device for determining temperature by means of electric lights, known as the "Thermo-Tel," has been announced by the Uehling Instrument Company, Paterson, N. J. The instrument consists of different colored electric lights, actuated by changes in temperature. When the temperature is within the limits for which the instrument is set a white light will be shining; when the temperature is above the limits a red light will be shining, and when the temperature is below the limits all lights will be out.

Each "Thermo-Tel" signal is set for the particular limits desired; for example, 190 and 193 deg. A glance at the colored lights will definitely determine whether the temperature is high, low or within said predetermined limits. If desired the signaling lights may be located at any distance from the temperature which is being observed. The temperature signals are accurate to within less than one-tenth of 1 deg. F.

▼

A NEW TYPE OF APARTMENT-SIZE WASHING MACHINE which combines a motor-driven washer and a unique type of hydraulic pressure drier is announced by the Mengel Body Company, Louisville, Ky. It is said to be the world's only small washer with a pressure drier.

•

A PAINT THAT IS AN INSULATOR, one thin coat of which, it is claimed, will stop 1,600 volts a.c. current, is announced by the Eastern Mabelite Corporation, New York. It is highly acid resisting, heat resisting and has remarkable abrasive qualities, is practically impervious to salt water and is a positive stop to electrolysis and corrosion, the manufacturer states.

▼

Portable Air-Cooling Unit

A compact, portable air-cooling unit using melting ice as the cooling medium is announced by the Carrier Research Laboratories, Newark, N. J. It is designed for use in offices, committee rooms, hotels, hospitals, etc. The new cooling device will lower the temperature of a room approximately 10 deg. from, say, 80 deg. F. to less than 70 deg. As the hot room air is cooled by contact with the melting ice and a series of metal grids upon which the ice rests it is dehumidified, further assuring a maximum of personal comfort during the hot season regardless of outside weather conditions.

▼

Tachometer for Testing Rotating Machine Speeds

A direct-reading hand tachometer for testing r.p.m. rotating machine speeds is announced by the Amthor Testing Instrument Company, Inc., Brooklyn. It features automatic fixed reading, whereby the speed readings are automatically fixed on the dial after each time the instrument is used. It automatically resets itself in the fraction of a second.

The dial is graduated to read directly in r.p.m., but the instrument is fully equipped so that all "feet per minute" surface and belt speeds can be taken. There are four separate speed ranges, each of which reads over the entire circumference of the dial, thereby providing a great deal more graduation space and consequently closer readings. Each is constructed with the balanced cross-pendulum governor movement, hand calibrated for accuracy and dead beat in action. Various ranges can be had for direct measurement of speeds to 12,000 r.p.m.

▼

A MIDGET DRILL that is light, handy and powerful is announced by the Speedway Manufacturing Company, Cicero, Ill. Spindle speed can be varied to the customer's desire, 550 r.p.m. to 3,000 r.p.m., with attendant variations in torque. This machine is built with the gear ratio the customer wants. It is not a machine with a gear shift or a dual speed arrangement.

▼

Vibrator for Internal Compaction of Concrete

A motor-driven vibrator, known as the Viber electric tamper, for internal compaction of concrete, is announced by the Viber Company, Los Angeles, Cal. The compactor consists of a $1\frac{1}{4}$-in. tube, 36 in. long, in which a shaft carrying an eccentric weight is caused to rotate by a $\frac{1}{3}$-hp. electric motor. The tube vibrates at a rate of 5,000 vibrations per minute. In operation the tube is inserted in the concrete, compactness being obtained in from 30 to 45 seconds. For placing concrete in deep walls the tamper is supplied with a flexible shaft which permits proper placing at any desired depth up to 20 ft. The machine operates on 110-volt current. Complete power units, including a self-contained generator, are supplied for use where electric current is not available.

▼

Direct Break Thermostat Without a Relay

A new direct-break thermostat, of interest to the trade because of the accuracy and the limits within which each temperature can be held, is announced by the Hartford Manufacturing Company, Hartford, Conn. It is of the direct-break type, not requiring a relay.

Some of the advantages claimed for this thermostat are: It is small and more compact than those thermostats now on the market of the direct-break type; it has a definite "off" position as well as indicating the oven heat; there is no strain set up on the thermostatic metal at any setting of the thermostat, thereby assuring the same degree of accuracy at each heat indefinitely, and a specially designed terminal block is used which enables the wiring of the thermostat to be quickly and efficiently accomplished.

▼

A NEW METHOD OF EDGING FLOORS, the belt running over soft roller instead of over hard, as an improvement over the flat type of edger shoe, is announced by the Porter-Cable Machine Company, Syracuse, N. Y. It is claimed that the belt lasts three times as long because there are no sharp angles to break down glue bond and cause grit shedding; less friction means less heat and thus less belt clogging. Much less power is required, which prevents motor trouble, allows the belt to run faster, thus doing more work.